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ABSTRACT

This collection of articles, an EE (Environmental Education) Toolbox resource, provides a context of theory and example to complement the suggestions and activities in the Toolbox Workshop Resource Manual. Section one, "Definitions of EE," describes the scope and context of EE and provides historical background, specific definitions and insight into the comprehensive process involved in teaching EE. Section two, "Integrating EE Into the Classroom," provides an introduction to several ways teachers might integrate EE into existing school curricula and includes essays by teachers who have turned EE topics into interdisciplinary studies or expanded them to include community resources. Section three, "Environmental Education Techniques," presents ideas for applying EE philosophy in the classroom and is concerned with learning issues for teachers (dealing with values and controversy), and ways of helping students approach action taking. Section four, "New Trends in Education," is about ideas and techniques that are transforming education generally. Section five, "Perceptions of EE," presents some of the diversity of opinion surrounding EE goals and techniques. Section six, "Multicultural and Urban EE," discusses the challenges of bringing EE to audiences that have not been effectively included in "traditional" EE efforts. (MKR)

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The
Environmental
Education
Toolbox

EE Reference Collection

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Introduction

THE ENVIRONMENTAL EDUCATION (EE) COMMUNITY has generated extensive literature that speaks to many types of programs and activities. However, this literature is scattered among a wide variety of academic and popular publications. NCEET has compiled the *EE Reference Collection* to make this literature more accessible to practitioners in the field. The *EE Reference Collection* is a component of NCEET's **EE Toolbox**, a set of resources for people who teach teachers about EE. The readings in this collection provide a context of theory and example to complement the suggestions and activities in the Toolbox *Workshop Resource Manual.*

For a balanced perspective, we have selected works by leaders in education and EE as well as critiques of the current practice of EE. We believe the articles in this collection are informative and thought-provoking. Several of these articles are included for their historical significance; the majority reflect issues in EE as they appear in the 1990's. These articles should be helpful to all of the EE Toolbox audience: teachers and inservice workshop facilitators with little environmental experience, environmental managers with little formal classroom experience, and experts and novices in both fields.

The collection is divided into six sections, each of which includes an overview and photocopied articles with annotations. All articles are reprinted with permission.

SECTION ONE, "DEFINITIONS OF EE," describes the scope and content of EE. The articles here provide historical background, specific definitions and insight into the comprehensive process involved in teaching EE. Several articles describe how environmental literacy goes beyond simple knowledge of ecology to include consideration of how an environmentally literate person thinks, feels, values, and acts.

SECTION TWO, "INTEGRATING EE INTO THE CLASSROOM," provides an introduction toseveral ways teachers might integrate EE into existing school curricula. Includes both academic perspectives and essays by teachers who have turned EE topics into interdisciplinary studies or expanded them to include community resources.

SECTION THREE, "ENVIRONMENTAL EDUCATION TECHNIQUES," presents ideas for applying EE philosophy in the classroom. These articles are concerned with learning, issues for teachers (dealing with values and controversy), and ways of helping students approach action taking.

SECTION FOUR, "NEW TRENDS IN EDUCATION," is about ideas and techniques that are transforming education generally.

SECTION FIVE, "PERCEPTIONS OF EE," presents some of the diversity of opinion surrounding EE goals and techniques.

SECTION SIX, "MULTICULTURAL AND URBAN EE," discusses the challenges of bringing EE to audiences that have not been effectively included in "traditional" EE efforts.

Definitions of Environmental Education

ENVIRONMENTAL EDUCATION (EE) has been, and continues to be defined in various ways. In broad terms, EE is an interdisciplinary process with the goal of equipping people with the knowledge, attitudes and skills they need to help resolve environmental issues.

This section provides an overview of EE's history, to help educators understand the evolution of thought that has shaped EE's definition. Articles in this section provide insight into the goals of EE, the complexity of its process, its interdisciplinary nature, its application to all school subject areas, and its challenges to educators in formal and non-formal settings.

Weilbacher, Mike. "Education That Cannot Wait," *E Magazine*, March/April 1991, pp. 29–35.

In this short article, Weilbacher (who hosts an environmental radio program in Philadelphia) gives us an overview and imagery of what is happening in EE today. An important trend that Weilbacher notes is that in the past, "most EE programs did lots of awareness, but inspired little action. That's changing."

Disinger, John F. "Environmental Education's Definitional Problem," *Information Bulletin No. 2.* ERIC Clearinghouse for Science, Mathematics and Environmental Education, 1983.

Disinger sets the context with an overview of the history of EE and a summary of more recent definitions of EE. He concludes that, although there is some debate over these definitions, most of them have common ground. Furthermore, a framework for EE has evolved; thus, differences in the definition of EE need not hinder our ability in "getting on with it."

Stapp, William B., et al. "The Concept of Environmental Education," *Journal of Environmental Education* 1:1, Fall 1969, pp. 30–31.

Stapp presents one of the first explicit definitions of EE, which he developed in a graduate seminar at the University of Michigan. The definition extends the concept of conservation education by including components of citizen responsibility and involvement in decisions concerning our environment. The definition is followed by four major objectives of this emerging discipline: understanding that the human race is an inseparable part of a system, understanding the natural and human-made environment, understanding biophysical problems confronting the environment, and forming attitudes of concern that motivate citizens to take action.

United Nations Educational, Scientific, and Cultural Organization and the United Nations Environmental Programme. "The Belgrade Charter," *Connect: UNESCO-UNEP Environmental Education Newsletter,* January 1976, pp. 1–2.

In 1975, participants at the UNESCO International Workshop on Environmental Education in Belgrade, Yugoslavia proposed a global framework for EE, commonly referred to as "the Belgrade Charter." The charter framework proposed that EE should "develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivation and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones."

United Nations Educational, Scientific, and Cultural Organization. "Framework for Environmental Education," *Final Report, Intergovernmental Conference on Environmental Education.* Paris, France: UNESCO ED/MD/49, 1978, pp. 23–29.

In October 1977, two years after Belgrade, participants of the Intergovernmental Conference on Environmental Education in Tbilisi, USSR, developed a framework for EE. Building upon the Belgrade Charter, the framework outlines goals and objectives, guiding principles, and target groups. Visionary in its day, the framework continues to guide EE today.

Hungerford, Harold, R. Ben Peyton, and Richard J. Wilke. "Goals for Curriculum Development in Environmental Education," *Journal of Environmental Education* 11:3, Spring 1980, pp. 42–47.

Building on Stapp's definition and the Tbilisi framework , Hungerford et al. developed more specific objectives and guidelines for curriculum development. The objectives are framed at four levels: ecological foundations, conceptual awareness of issues and values, investigation and evaluation, and environmental action skills. The authors also remind us that EE is more than the study of ecology: it is an interdisciplinary pursuit and a comprehensive process, involving values clarification and providing opportunities for participation and action.

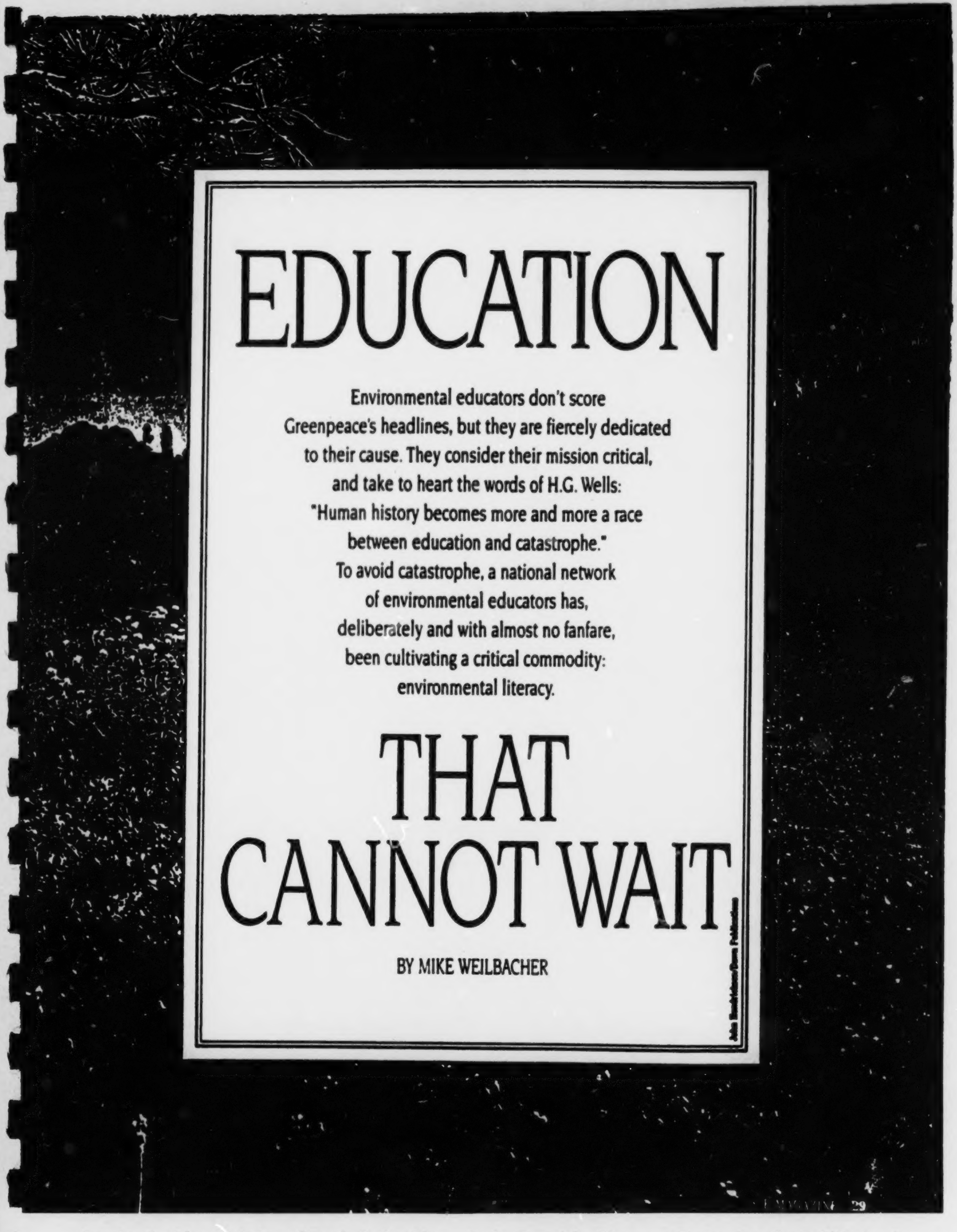
Orr, David W. "Environmental Education and Ecological Literacy," *Holistic Education Review*, May 1990, pp. 48-53.
Orr presents seven propositions for EE, including "all education is EE," and "the way education occurs is as important as its content." According to Orr, the larger purpose of EE is ecological literacy. He further discusses this concept to mean "a quality of mind that seeks out connections." In addition, pratical competence is needed. Orr implies that the study of EE with its goal of ecological literacy will direct us toward a sustainable society.

Roth, Charles E. *Environmental Literacy: Its Roots, Evolution and Directions in the 1990's*, rev. ed. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education, 1992, Chapter 2, "Operationalizing the Concept."

Roth also expands our notion of environmental literacy. "People seldom think of literacy beyond certain cognitive skills. However, in the more modern sense . . . literacy involves particular ways of thinking, acting and valuing." Part I of this article offers a definition of environmental literacy that parallels definitions of EE offered in Section One. Part II presents an operationalization of the concept of environmental literacy. Helpful is the idea that literacy is a continuum, with different levels and goals. Teachers may find it useful to place themselves and their classes along the continuum in order to better define their direction and objectives.

Hammond, Bill. "The Monday Group: From Awareness to Action," in *Project WILD*. Boulder: Western Regional Environmental Education Council, 1985, pp. 264–271.

With his class in Fort Myers, Florida, Bill Hammond gives us an exciting example of what is possible with EE and environmental action-taking. This is truly an expanded view of environmental literacy. While the structure of his class is unique and may be difficult to transfer to many situations, the operating principles and framework are applicable to any classroom.



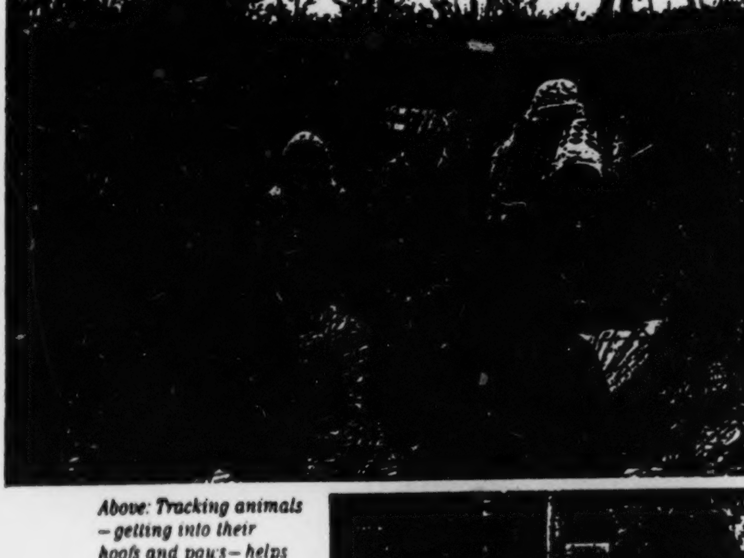
EDUCATION

Environmental educators don't score Greenpeace's headlines, but they are fiercely dedicated to their cause. They consider their mission critical, and take to heart the words of H.G. Wells: "Human history becomes more and more a race between education and catastrophe." To avoid catastrophe, a national network of environmental educators has, deliberately and with almost no fanfare, been cultivating a critical commodity: environmental literacy.

THAT CANNOT WAIT

BY MIKE WEILBACHER

Reprinted with permission of Earth Action Network via Copyright Clearance Center, Due for Publication in August 1994, Weilbacher, Mike. "Education That Cannot Wait," *E Magazine*, March/April 1991.



Jeff Wilcox/Dodge Nature Center

Above: Tracking animals – getting into their hoofs and paws – helps kids empathize with them. Previous spread: Student enjoys nature's solitude. Pacific Crest Trail, California.

1987 Mark Bondarenko

Center: State of the art environmental education involves students in solving computer-simulated environmental dilemmas.

Bottom: Students plan the restoration of steelhead trout whose habitats were destroyed by logging.

1990 David J. Cross

At the edge of the Danube River in Budapest, a high school student measures sewage-related bacteria, tallies her results and mails them to a classroom in Cleveland. The Cleveland kids examine her numbers, and exchange bacterial counts from their river, the infamous Cuyahoga that twice caught fire.

On a class trip to a Florida cypress swamp, a seventh grader wades in for his "solo" – a time for solitude and swamp sounds. In a journal, he draws himself as an alligator, floating in search of prey. Meanwhile, in an Oregon forest, a gaggle of pre-teens loudly denounces the evil King Snoid's decree that "all life shall remain separate." Each signs a "Declaration of *Inter*dependence," vowing to overthrow Snoid by finding evidence of interrelationships.

And in a Pennsylvania school, 400 students create "Earthfest," a school-wide celebration consisting of water cycle dances, food chain pantomimes, and adaptation raps.

Across the country, around the world, thousands of educators invite millions of people to engage in activities just like these. Welcome to the profession called "environmental education." To the folks that do it, it's simply "EE." It's also been called "education that cannot wait."

Curiously, it's the best and worst of times for this profession. The best: schools everywhere now offer environmental courses to unprecedented numbers of students, high school ecology clubs have been resurrected, and thousands of schools permanently celebrate Earth Day. Last November, President Bush signed the National Environmental Education Act, noting the importance of "giving teachers the tools to teach the importance of conservation."

The worst: the complexity of global environmental problems requires careful explanations with no hint of Chicken Little. Once, environmental educators specialized in leading nature walks. Now, they understand that more than birdwalks and wildflower hunts are needed. Surrounded by news both good and bad, EE'ers still see the "Green 90s" as the perfect environment for implementing their mission.

EE's Mission

A fifth grader places her hands on her stomach, and runs toward her classmates. She's playing "Oh, Deer!", pretending to be a hungry doe. If she tags a classmate making the food sign, she lives; otherwise she dies. "Oh, Deer!" is the favorite activity of the very popular *Project Wild*.

When describing *Project Wild's* goal, director Dr. Cheryl Charles could just as well be defining EE's mission. "It's to assist learners in developing awareness, knowledge, skills and commitment that result in informed decisions, responsible behavior and constructive action concerning wildlife and the environment upon which we all depend."

Dr. Woodward Bousquet chairs environmental studies at Warren Wilson College in Swannanoa, North Carolina. He says "the house of environmental education is built upon a three part foundation: natural sciences, social sciences and citizenship skills. People need firm understandings of ecology, economics, politics and ethics to be able to make environmentally-responsible decisions."

These "citizenship skills" separate EE from other endeavors. Scratch any environmental educator's surface, and you'll quickly discover s/he's got an ambitious agenda: a transformation of your attitudes, and a change in your behavior.

The goal? "Sustainability," says EE pioneer Dr. William Stapp, professor at the University of Michigan. "Issues like pollution and soil erosion are symptoms of a larger problem—our lifestyles." The key to understanding EE? A program must deal with the root causes of environmental ills—values and attitudes mixed with a corresponding lack of skills and knowledge. To do this, EE'ers employ a model that moves us from becoming aware of the total environment, to giving us knowledge, attitudes and skills, to finally empowering us to take positive environmental action. "Awareness to action" is EE's continuum.

This elevation of environmental literacy exists within a larger, more powerful vision that includes schools regularly presenting environmental education through teachers that themselves possess environmental ethics. Workplaces where environmental concerns are central. A mass media treating the environment as a mainstream concern, a public with firmly-planted eco-values, and politicians who can only be elected without any environmental skeletons in their closets.

To accomplish this mission, environmental educators hope to create "cradle-to-grave programs" that deliver EE throughout our lives. It's a formidable task, one that requires environmental educators to tend a variety of gardens.

The Many Gardens of EE

One gardener is Dr. Gus Medina, EE specialist with the World Wildlife Fund. He presides over the North American Association for Environmental Education (NAAEE), the largest support group for professional EE'ers, and describes the network of environmental educators as "teachers, staff of environmental and nature centers, parks, museums, zoos and university professors." NAAEE's membership tops 1,300, and its annual conference in 1990 attracted members from 14 countries outside of North America.

There is, indeed, a complex web of interaction in the EE community. Like a food chain, there are producers, agencies and independent educators who create and market EE programs like *Project Wild* and *Earth Education*. Nature centers operate as primary consumers, digesting these curricula for later feeding to schools and community groups. Universities train new practitioners to enter this chain, and conduct research on how well programs work.

Advocacy groups engage in education, too. The National Wildlife Federation, for example, provides a large menu of educational opportunities, from *Ranger Rick's Nature Magazine* for kids to adult Conservation Summits, offering classes ranging from lobbying to nature photography.

The National Audubon Society, Sierra Club, energy groups, even humane societies dedicate resources to education about the environment—which can present a problem. Dr. John Hug coordinates the state of Ohio's environmental education activities. "All of us are environmentalists and educators," he says, "but you can't wear both hats simultaneously. Educators *lead* learners, helping them to get information, examine their behavior—and then make a decision."

Is it contradictory, though, that educators, like activists, want change? "You can get people to change in a number of ways," Hug explains. "Fear, economics, coercion. These are not education."

The National Wildlife Federation's "Earth Day Every Day" teacher's guide demonstrates the two-hatted dilemma. A full-color poster presented environmental concerns with captions that told kids to "convince your school principal to switch to fluorescent bulbs," and "encourage your parents to use cloth diapers."

Debates like this consume tons of energy within the small-but-serious clan of environmental educators. Formally born in 1968, the profession's practitioners immediately went to work plowing parallel rows—one in the schools, the other in nature centers.

Environmental Education Goes to School

When EE knocked on school doors, hoping to bring critical information inside, the doors didn't open. Teachers were afraid that environmental sciences looked too complicated. Some said the curriculum was too crowded for the environment. Principals huffed, "We already do environmental education; we teach ecology for a week in biology class." And EE dealt with issues, something schools usually avoided.

Additionally, anything prefaced by the adjective "environmental" tasted of politics in the days after Earth Day 1970. *Project Wild's* Cheryl Charles neatly

→

Bill Stapp of the University of Michigan—one of environmental education's "founding fathers."

Students study the ecological impacts of a prairie fire at the Dodge Nature Center in St. Paul, Minnesota.

The Institute for Earth Education

How are different bird beaks adapted to obtaining different types of food? Students in this Sunship Earth program find out the fun way

sidestepped that problem. "The word 'environmental' polarizes people instantly, so I talk of 'education *about* the environment' instead."

Environmental educators diligently kept knocking, slowly but surely finding teachers and administrators who opened doors. Suddenly, the rules changed. In 1988, "environment" became mainstream, and teachers clamored for materials.

Dr. Dean Steinhart oversees Pennsylvania's EE efforts. That state now requires 30 hours of environmental science instruction in high school, a unique requirement nationwide. But he's not lonely. "I can find someone just like me in almost every state," he asserts, "someone whose job it is to implement environmental education statewide." He throws out some startling statistics. Just five years ago, 2,000 Pennsylvania high schoolers chose a one-credit environmental science elective, most drop-outs from the "hard sciences"—biology, chemistry and physics. In September 1990, however, 35,440 teens enrolled. "For the first time, we have more kids enrolled in environmental science than in physics." Steinhart notes, "The impetus has come from the kids and the teachers, not the parents and school boards."

Wisconsin now requires that certified teachers receive training in environmental education, and schools must develop curriculum plans that deliver EE. Wisconsin and Pennsylvania have the most advanced requirements for schools, but other states are rapidly following.

To bring the environment into the classroom—and the classroom into the environment—teachers turn to a wealth of programs and curricula available.

Model Programs

Project Wild publishes activity guides for teachers that present almost 300 activities about wildlife. In

Bird's-Eye View

Children love animals, especially Leonardo Da Vinci, Michelangelo, Donatello and Raphael. "Hundreds of kids are now buying turtles and being surprised when they don't eat pizza, jump out the window, and do karate," says Michael Kaufmann, referring to the Teenage Mutant Ninja Turtles. As the director of educational programs for New York City's American Society for the Prevention of Cruelty to Animals (ASPCA), he has the job of introducing children—and adults—to animals who haven't had such good marketing campaigns.

Children do have a natural empathy for animals, but they are quick to adopt prevailing attitudes toward them, dividing them into scary or friendly, pets or dinner, good or bad. Years ago, while touring rural Nevada gradeschools with a slide show about a coyote trapper, Patty Finch, director of the National Association for Humane and Environmental Education (NAHEE) in East Haddam, Connecticut, met a boy with a dilemma—he ran traps himself to make money to buy food for his pets. Teachers shouldn't tell students what to believe, Finch says, but they can certainly present them with a humane point of view—that all animals deserve respect, and that humans have a responsibility toward the rest of creation. "Humane and environmental education supplement each other beautifully," says Sheila Schwartz, a school teacher and President of New York City's Humane Education Committee (HEC). "Kids that care about animals also start to care about those animals' habitats."

Humane education can be many things, from helping preschoolers understand why dogs bite, to discussing the ethics of dissecting frogs. It can also be a matter of incorporating humane matters into other subjects. "Ben Franklin wanted to make the turkey our national bird," offers Kaufmann. "A history lesson could talk about how the wild turkey almost became extinct. Humane education should not just be an annual visit from the local shelter to discuss cats and dogs."

At the turn of the century, humane education was a staple of the American classroom. Even today 22 states have laws mandating its inclusion in the curriculum, but many teachers remain so unfamiliar with the term they assume it is a misprint for "human" education. "Which wouldn't be bad either," says Finch. Over the past few years, NAHEE, the Peninsula Humane Society of San Mateo, California and other groups have been making a concerted effort to turn this situation around. "New York City's Education Law mandates humane education. It's been on the books for 60 years," says Schwartz.

In New York City, the ASPCA holds teacher workshops, and the Board of Education, with help from HEC, has produced a "Humane Education Resource Guide" with lots of lesson plans. And NAHEE, a division of the Humane Society of the United States, the largest group in the field, besides publishing a monthly newsletter, also produces a daily message which several schools now broadcast over their intercoms. "Two principals told me it has cut their playground fights in half," Finch reports. It has probably been good for the animals as well." —*Will Nixon*

Humane educators say caring for animals leads children to care for the rest of the environment.

Mary Wright/The Marin Humane Society

10 years, *Project Wild* has trained 250,000 educators. Cheryl Charles says. "We've conservatively reached more than 20 million students.

Project Wild's close cousin, *Project Learning Tree*, contains 200 activities about the role of plants and forests. Like Project Wild, it's free to teachers who attend training workshops.

Maura O'Connor, while working at the Schlitz Audubon Center in Milwaukee, saw a vacant niche, and teamed up with Kathy McGlauflin to write *Living Lightly in the City*, a binder-full of activities that help urban kids understand *their* environment. Bob Nichols, executive director of the Center and publisher of *Living Lightly*, says it's designed to "bridge the relevancy gap between nature and the urban dweller," an audience underserved by the profession.

O'Connor specializes in niche-filling. After writing *Living Lightly*, she moved to Hawaii, and noted "there were no educational materials on the tropical ecology of Hawaii. Teachers were hungry for material that didn't show the change of seasons or oak trees and squirrels." She created Project Ohia, named for Hawaii's most-common native tree, and "held our first workshop for elementary teachers in January. We had a waiting list of 150! I think we hit a nerve."

The National Association for Humane and Environmental Education (NAHEE) offers a supplementary environmental education program for grades two through six through their publications *Kind News* and *Kind Teacher. Kind (Kids in Nature's Defense) News* is a four-page student newspaper, arriving monthly in bundles of 32 copies along with a teacher's guide. This school year, students received information on the need for biodiversity, and on how children worldwide are saving rainforests. The newspaper features puzzles and student opinions on everything from air pollution to zoos.

Perhaps the most creative force in EE curriculum design is Steve Van Matre, the charismatic leader of the Institute for Earth Education in Illinois. He's written some of the field's best-sellers: *Acclimatization*, *Sunship Earth*, and his latest, *Earth Education*. He infuses his activities with "magic," not unexpected from a man whose mossy beard and lanky build make him look like one of Tolkien's wizards.

Sunship Earth features engaging activities that unlock a secret code—EC-DC-IC-A. Each letter represents a major ecological concept; E is "energy flow," for example. It's here that King Snoid demonstrates "interdependence." *Earth Education* immerses learners in ecological systems as the "deep ecology" wing of EE. Van Metre's work has been replicated planet-wide; his activities form the backbone of many nature center programs.

Once, environmental educators begged to be let inside schools. Today, teachers are banging on the front doors of nature centers, what Bob Thomas of the Louisiana Nature and Science Center calls "the grassroots places for environmental education."

The Nature Center Concept

In Michigan, the Chippewa Nature Center sits at the confluence of the Pine and Chippewa Rivers. Dick Touvell, its director, defines the nature center as "an outdoor classroom, where we bring people into intimate contact with air and soil, flora and fauna." A nature center typically features land with intact natural systems, an educational building, and a staff. But to some, none of these is "the nature center." Bob Thomas says of his center in New Orleans, "it's a concept, not a building."

Nature centers form the thickest branch of EE's tree, as Touvell can personally attest. He directed the production of *The Directory of Natural Science Centers*, a catalogue of nature centers in North America. "We found 1,300 sites, and that's not all of them." Nature centers, many with charming names like the Mosquito Hill Nature Center in Wisconsin and Turtle Mountain Environmental Learning Center in North Dakota, are mostly small operations, with correspondingly small staffs and operating budgets.

The Schuylkill Center for Environmental Education in Philadelphia is more department store than mom-and-pop store. Like others, it offers field trip, workshops and weekend programs. What's special about Schuylkill is the breadth of its vision. There's a paved forest trail for wheelchair groups; its enormous Eco-Van takes ecology experiments directly into schools. Director Dick James says "every year we look around and say, okay we've done that. What's next?"

His center created REEP, the Regional Environmental Education Program. Since 1983, more than 400 area teachers have written, piloted and evaluated EE activities. REEP director Nancy Christie explains: "We train teachers, then require them—in turn—to train colleagues in their schools, extending our reach, and giving teachers ownership." REEP is

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The controversial and mossy-bearded Steve Van Matre is founder of the Institute for Earth Education.

"Once, environmental educators begged to be let inside schools. Today, the tide is reversed, and teachers are banging on the front doors of nature centers."

The bacteria count from an urban river is taken, as a project of the Global Rivers Environmental Education Network. Students' data are exchanged internationally.

"Environmental educators hope to create 'cradle to grave' programs that deliver EE throughout our lives. It's a formidable task"

funneled to teachers through 10 nature centers in New Jersey and Pennsylvania, orchestrated under Schuylkill's umbrella. "We're now working on environmentalizing high school chemistry and physics courses, and will be assembling a writing team this summer," says Christie.

These centers, the front line in the battle for environmental literacy, are making important links in their communities. When school teachers knock these days, they don't just want information anymore. Now, they want to actively involve the kids in environmental concerns.

No Longer Missing In Action

Overlooking San Francisco Bay, the Coyote Point Museum is a rarity, a museum dedicated exclusively to the environment. Inside, kids are playing educator Lori Mann's version of musical chairs. "Chairs are labelled air, water, land," she explains. "Kids are animals in the ecosystem. As chairs are removed because of pollution or a Valdez-like disaster, kids see the effect these events have on habitats."

Coyote Point's exhibits recreate the local ecosystem. "It's like walking from the bay, over the mountains to the coast," Mann explains. Both exhibits and educational programs discuss human impact on the environment. Its new Global Awareness Program teaches middle schoolers "about issues like the rainforest, infusing throughout the discussion what kids their age can do about the rainforest. We try to link personal behavior with the implications of that behavior."

This style of education is EE's latest wrinkle. Environmental educators always professed to lead learners along a continuum that began with awareness and ended in action. However, most EE programs did lots of awareness, but inspired little action. That's changing.

Dale Wittig/N.Y. Academy of Sciences

Educator Talbert Spence questions whether environmental education programs are reaching minority students.

Bill Hammond pioneered "action education" at Lee County Schools in Florida. Since 1969, he's supervised high schoolers who hold weekly meetings to tackle environmental projects in the community. To date, these teens have preserved a 1,000-acre cypress swamp, passed a bald eagle protection law, and set aside Florida's first manatee preserve. It wasn't easy," says Hammond. "It took six years to buy Six Mile Cypress Swamp. The eagle ordinance took four years; the kids went to 17 public hearings and wrote 23 drafts." Hammond creates camaraderie and trust, giving his students meaningful problem-solving skills. He lets "the students choose their projects. Power comes when you teach skills, and then let them decide and take ownership of the problem."

Hammond's group is unique, though he's quick to point out that "there's an amazing number of action projects now." However, his group transcends the norm. "Most action projects are recycling newspapers or picking up litter," states Dean Steinhart of Pennsylvania.

William Stapp of the University of Michigan moved powerfully to the action side through GREEN, the Global Rivers Environmental Education Network. Students in 42 states and 35 countries monitor their region's rivers, measuring bacteria, dissolved oxygen and other indicators. In Michigan alone, some 30 rivers are monitored, with measurements sent electronically to GREEN's office. "After the tests," Stapp explains, "students visualize how they'd like their river to look, and develop action plans to create the vision. Here they enter politics, realizing that poor people live on the most polluted rivers."

John [illegible] Publications

In this popular nature awareness activity, students get to know a tree blindfolded—then try to find their tree among many others without the blindfold.

A new California law requires schools to adopt an endangered species, study the creature's features, and design an action plan that ensures its preservation. The students of San Diego's Albert Joe Hickman Elementary School will soon be testifying in Sacramento for the San Diego Mesa Mint, a local endangered plant, their official adopted species. "The kids will then do a publicity campaign to educate the community about the mint," says Betsy Olson, California's coordinator of environmental education.

Olson describes the mandate of the Endangered Species Education Act. "We send every California school materials on adopting local species, then they submit their action plans to our office for review." Among the reviewers—kids who created exemplary plans themselves. "The Hickman kids will present their action plan to the legislature for Earth Day 1991."

Criticism and Concern

No profession is without disagreements, especially one with an urgent mission. Steve Van Matre has emerged as the field's biggest critic. "Environmental education has failed," he flat-out asserts in his latest book, the crisply-worded *Earth Education*. He's seceded from the field, and no longer engages in environmental education. He calls his work "Earth education," thank you.

EE failed, he writes, because it suffers from "definition dementia," whereby too many tangential and trivial activities, like ropes courses and

Young artist blooms along with her subject during outdoor sketching session.

wildflower walks, pass as EE. Failed because "there's no leadership, no direction," because the action components are usually one-shot projects that don't directly connect to learners's lives. He criticizes the use of activity guides where teachers sample activities at random, preferring sequential, focused programs that include quality time for presenting "magical learning adventures." Put EE up there next to the 3 R's; "What's more basic than understanding how the Earth operates?" he asks.

The consensus in the field is that many of his comments ring true. Cheryl Charles admits that *Project Wild* "is not a comprehensive EE program," and wasn't designed to be a student's sole EE experience. Still, she and Hammond concur that Van Matre doesn't understand how schools operate—the activity guides have gotten material to teachers, "and its the classroom teacher who designs curriculum," asserts Charles. Most practitioners in the field like Van Matre's work, but are bewildered by his vitriol.

There are other concerns, too. Talbert Spence of the New York Academy of Sciences thinks EE programs neglect the urban audience. "You can't write off the majority of the population living in cities like New York. I haven't seen a major rush at reaching the minority audience, either." Gus Medina acknowledges, "Most of EE has been done for a middle class audience, and we need to reach out to minority populations."

Others worry about accurately teaching the complex science behind global warming or acid rain, while providing critical thinking skills that give more than "bumper-sticker answers to lapel-pin questions." Dick Touvell is nervous about the economy, for he remembers the impact of the last recession. "About 300 nature centers went out of business. I think we're all going to see some serious problems."

Still, environmental educators acknowledge that they live in interesting times, especially considering the recent behavior of George Bush.

A National Mandate

Maybe it's not surprising that the president signed a National Environmental Education Act. He is, after all, the "education president." Establishing an Office of Environmental Education within the EPA, the bill authorizes $12 million for seeding EE efforts. But environmental educators are cautious for, as Yogi Berra said, it's "deja vu all over again." In 1970, Richard Nixon created an Office of Environmental Education within the Department of Health, Education and Welfare. It never received its full congressional appropriation, and didn't survive.

Bob Thomas is hopeful that "the office will serve as a coordinator for federal agencies doing EE." John Hug wonders if "the money will be spent on the things we've been doing for 200 years—like pontificating, or paper-and-pencil tests." Cheryl Charles wants it "to pay attention to what's already been done, and not operate in a vacuum." Dick James remembers this as "about the fourth Second Coming of an Office of EE."

Van Matre thinks the Office will fund projects he says have already failed. "It can't have much effect," he summarizes. Hammond is concerned that too much of the Office's work will be done through universities, "the least successful institutions for transferring knowledge." And he wonders why "the Department of Education didn't want it, and it was back-doored into the EPA."

Michael O'Reilly heads the Office, which he sees as fitting neatly into the EPA. "Environmental education is not just something nice to do, it's central to EPA's mission. Our job is to cultivate an ethic, improving overall environmental literacy."

"Put EE up there next to the 3 R's, says Steve Van Matre. "What's more basic than understanding how the Earth operates?"

Environmental education lends itself to magic moments.

Perhaps this one will be different; perhaps a federal platform will launch EE into greater orbits of visibility. Maybe the EE community can now command the resources needed for an all-out assault on environmental illiteracy. Only time will tell. ■

MIKE WEILBACHER *hosts a Philadelphia public radio news show about the environment, and travels the country performing environmental theater in schools and nature centers.*

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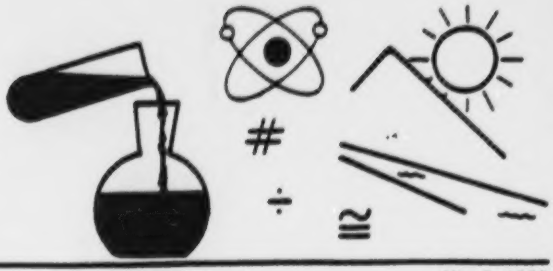

Information Bulletin No. 2, 1983

Environmental Education's Definitional Problem

EDITOR'S COMMENTS

There are those individuals who say that if you can "name" something, you own some knowledge of it. Others consider that knowledge is better displayed if you can provide an operational definition. This issue of the ERIC/SMEAC information bulletin was prepared by Dr. John F. Disinger, Associate Director-Environmental Education in an attempt to examine the various definitions related to environmental education.

A continuing dilemma for those concerned with environmental education lies in the matter of definition. There are some who strive to achieve universal agreement as to a precise meaning and discrete set of descriptive parameters, but others who prefer not to expend energy on what they perceive as an inherently non-productive exercise. There also exists a third population, a potpourri of groups and individuals who have independently or semi-autonomously forwarded a variety of definitions and descriptive statements, on occasion demonstrating strong overlap and, on occasion, equally virulent disagreement.

It is at least interesting, and may be productive, to assemble a representative selection of definitions for the purpose of comparing and contrasting them. Attempting to identify commonalities among them, concurrently highlighting disparities and inconsistencies, could as a minimum define the boundaries of the problem, and may provide a platform for achieving its resolution.

Much of this has been done before. Harvey (1976, 1977) reported a rigorous analysis of existing definitions and models as groundwork for the development and presentation of a "delineation of substantive structure" for environmental education; included was a mediating definition. His study has rarely been cited, perhaps because it was not reported in the journal literature and thus for practical purposes may have been unavailable to those who might have found it of use, had they found it at all. Alternatively, it may be that environmental educators of varying plumages were not, and are not, ready for it. General lack of acknowledgement of another study with a related aim but employing a somewhat different approach (Lucas, 1972, 1980, 1980-81) lends credence to either of these possibilities.

This information bulletin re-examines a number of the early definitions and parameter statements reported by Harvey, and includes brief summaries of the outcomes of the Harvey and Lucas studies. Much of the historical material reported is derived from papers by Malcolm Swan (1975), Roderick Nash (1976), John Kirk (1977), and Charles Roth (1978), all cogent reviews of the early history of environmental education and its antecedents. Another key source is Clay Schoenfeld's *Outlines of Environmental Education* (1971b), a selection of seminal papers from the first two volumes of *The Journal of Environmental Education*. An ERIC search unearthed other definitions and definitional discussions, including but not limited to those too recently advanced to be included in the primary sources. They are also reported in this bulletin in an attempt to develop a current overview of the status of the environmental education definitional problem.

Origin of the Term

Even the origin of the term *environmental education* has been subject to discussion. Harvey (1976) noted a 1968 paper by Schoenfeld as the first use of the term in the scholarly literature, commenting that it was not specifically defined therein. Schoenfeld has disclaimed inventing it, instead (1979) crediting its first use to Brennan, citing the latter's 1964 address to the American Association for the Advancement of Science. C. Roth (1978) also has mentioned Brennan as originator, referencing a 1957 article in the *Bulletin of the Massachusetts Audubon Society*.

However, there is at least one report (Kirk, 1983) of an earlier use: in a 1948 presentation at a Paris meeting of the International Union for the Conservation of Nature and Natural Resources (IUCN) Thomas Pritchard, at that time Deputy Director of The Nature Conservancy in Wales, identified the need for an educational approach to the synthesis of the natural and social sciences, suggesting that it might be called *environmental education*.

Brennan (1979) has acknowledged his early use of the term, but has disavowed any intention of using it other than as a synonym for *conservation education*, in the sense that the latter was used by Brandwein and himself (Proceedings, 1967:17):

> (Conservation education is) the recognition by man of his interdependence with his environment and all of life and his responsibility to maintain the environment in a manner fit for life and fit for living.

Antecedents

It is frequently acknowledged that the primary antecedents of environmental education were *nature study, outdoor education*, and *conservation education*. Nash (1976) summarized:

> The roots of environmental education lie in the same era and mentality as the beginnings of reaction against the university ideal (of compartmentalization of knowledge—Ed.). As early as 1891 Wilbur Jackman's *Nature Study for the Common Schools* launched a nature study movement which took students outdoors to explore an indivisible environment with an integrated academic approach. Outdoor education, as it was called by theorists such as L. B. Sharp and Julian Smith in the 1920s, had a very similar purpose. Nature study and outdoor education forced an appreciation of the multiplicity of factors that the classroom tended to isolate. Knowledge was integrated by an integrated environment.
>
> The 'Dust Bowl' mentality of the 1930s gave rise to conservation education. Its primary object was to awaken Americans to environ-

> mental problems and the importance of conserving various natural resources. Because conservation education focused on problems which themselves were products of many interrelated factors, students exposed to such programs pursued a more integrated learning program. Clearly such an approach ran counter to prevailing academic theory . . . (p. 14)

In some discussions other antecedents are nominated; some are noted briefly below. That fact that each antecedent continues to maintain its own proponents, sometimes operating separately from, at other times in conjunction with, one another and/or under the environmental education banner, provides additional evidence of continuing lack of common definition. A quotation from a 1971 Report of the Educational Products Information Exchange summarizes the situation:

> The term environmental education is in itself most loosely defined. At several recent environmental education conferences, the following terms were used synonymously: Environmental Education, Environmental-Ecological Education, Ecological Education, Conservation Education, Camping Education, Outdoor Education, and Environmental Science Education . . . (p. 5)

Nature Study

Nature study was not one of the related areas included in the EPIE statement. However, in making a point similar to Nash's, Brice (1972) stated:

> The antecedents of contemporary environmental education can be traced to the nature study movement which developed during the latter part of the nineteenth century and dominated early childhood education until the 1920s. (p. 3)

C. Roth (1978) has provided this commentary on the nature study movement:

> Unfortunately many of those who tried to put nature study into practice saw in (Liberty Hyde) Bailey's work only what they wanted to see; they focused on the artsy end of things and mere rambles in the countryside. Respect for the nature study approach dwindled and died in the forties and fifties and the star of rigorous science education began to rise. Bailey is being rediscovered today and people are amazed at the currentness of his thinking; it is almost as if nothing had changed in the 75 years since he wrote it. 'Mere facts are dead,' he wrote, 'but the meaning of facts is life. The getting of information is but the beginning of education. With all the getting, get understanding.'
>
> In large measure it would appear that the nature study movement was derailed by followers who did not understand adequately its underlying philosophy, but that does not adequately reflect what happened. Implementation of the precepts of Bailey's ideas and those of other key thinkers in the movement would have meant a restructuring of school organization, particularly outside the essentially rural one-room schoolhouse where it originated and flourished. Key to the thinking was Bailey's statement that nature study 'is putting the child into intimate and sympathetic contact with the things of the external world.' (p. 14)

Conservation Education

In the early 1900s the focus of the conservation movement in the United States was on the conservation of human resouces. This particular aspect has since evolved into present-day health education, and as such does not seem particularly pertinent to the present discussion (Swan, 1975). But by 1935, sufficient emphasis on the natural world had occurred to elicit this statement from the Educational Policies Commission of the National Education Association, as quoted by Funderburk (1948):

> Forests, soils, grasslands, water, minerals, oils, fish, game, and scenic beauty are among the rich natural endowments of the area of the North American continent covered by the United States. Realization of the basic importance of these resources, determination to utilize them for the common good through long range planning, and general knowledge of appropriate remedial and preventive conservation procedures are among the marks of an educated citizen. Since future welfare and safety depend on those things, the schools may well assume considerable responsibility for checking the ravages upon the heritage of the nation made by ignorance, indifference, carelessness, and unbridled selfishness. (pp. 30-31)

This perspective has become and remains the viewpoint of many conservation educators; much of their concern deals with the meanings and application of such terms as "wise use" and "natural resources management." C. Roth has noted (1978):

> The conservation education movement originated in large measure from a governmental base. As environmental problem after environmental problem, from forest depletion to chemical pollution, was met through creation of governmental agencies, from the U.S. Forest Service to the Environmental Protection Agency, certain steps occurred. The first was usually legislation, then enforcement, and then the realization that education was needed so that people would understand and willingly obey the laws. This was not usually 'education' in its broadest, more open, sense, but rather 'advocacy education.' Most of the people assigned to this task were resource, rather than education, oriented. They put out a great deal of printed information and used the public media extensively, but they also wanted to reach out to the great captive audiences in the classrooms . . . (p. 15)

C. Roth and Swan have both noted successful efforts to legislate conservation education into state-level curricula, but question the bottom-line effectiveness of such legislation—i.e., that which is legislated may not be taught. Roth has indicated parallel doubts concerning the effectiveness of the long-standard chapters on conservation included in many elementary and junior high school science textbooks, and some social studies texts.

Outdoor Education

Outdoor education has historically been defined as an educational method or approach—"the use of resources outside the classroom for educational purposes." (Swan, 1975). As such, it has been an important aspect of both nature study and conservation education, but "its direct antecedents as a field of study date back only into the 1920s, and are associated with the conservation of human resources branch of the conservation movement." (Swan, 1975:9) In addition to L. B. Sharp and Julian Smith, mentioned previously, the movement has been closely identified with John Dewey, in that it fits neatly with "learning by doing" philosophies. Sharp is credited with the precise definitional statement—"teach outdoors what is best taught outdoors, and teach indoors what is most appropriate there." According to Swan:

> Perhaps the greatest factor distinguishing outdoor education from the other movements . . . is its application to all components and subjects of the curriculum—art, music, mathematics, science, etc. Although there are many who would give an environmental orientation to everything done in the school, there is that essential difference that outdoor education takes place outside the classroom. The others . . . can and should take place both in and outside the classroom. (1975:10)

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An important aspect of the outdoor education movement has been the school camping movement (C. Roth, 1978); in some ways, school camping *is* outdoor education in the minds of many. Kirk (1977) credits William Gould Vinal as its progenitor. C. Roth comments that school camping had within its successes the seeds of its shortcomings: it is expensive, thus a prime target for cutting in times of budgetary constraint; and it "... leads many (school) systems to feel that they have done their duty to environmental education completely if they send their kids off to camp for a week." (1978:16)

Antecedent and Concurrent

Several other educational movements have been identified as forerunners and/or concurrent companions of environmental education.

Resource-use education, a social-studies "twin" of conservation education, focused more heavily on economics and geography than on the natural sciences; according to C. Roth, "the resource-use education people tended to utilize the classroom teacher to a much greater extent in developing instructional materials, (and) their materials were often more pedagogically useful but the content was often much weaker than the conservation education materials." (1978:16)

Progressive education, "the most education-oriented of the forerunners of environmental education," with roots back to Comenius, Rousseau, Pestalozzi, and Froebel, had "its philosophical touchstone in the thought of John Dewey." (C. Roth, 1978:16) The original purpose of this movement related to making education more responsive to the needs of children; among its accomplishments were "some curriculum reforms toward a more holistic approach to learning." The progressive education movement was for a time redirected toward radical social reform, but Dewey's ideas have been reinstituted in part today in the forms of humanistic and experiential education (C. Roth, 1978: 16-17).

Resource management education "has represented the professionalization of certain distinct man-land relationships: soil conservation, water management, game management, park management, urban and regional planning, landscape design, architecture, environmental engineering, metropolitan management, and so on" (Schoenfeld, 1971a:4).

Population education became "a part of the environmental quality movement when it was recognized that the issues of population and environmental impact were interwoven and ... that population growth was like a gigantic time bomb" (Swan, 1975:10-11). "The concern for population education was also partly the result of changes in lifestyles that occur naturally as a nation matures and industrializes."

General education has been characterized by Nash (1976:13) as "a deliberate retreat from the tendency of the Germanic university ideal to compartmentalize knowledge, and as such shares with environmental education the basic philosophy of the integration of knowledge." Nash compares them in terms of multidisciplinary approaches, i.e., "rejection of the idea that knowledge is divided into so many pigeon holes and that extending knowledge means reaching back further and further into the holes," (p. 14) and problem orientation, which forces cutting across disciplinary lines. Acording to Nash, environmental education might be viewed as *purposeful* general education.

During the past decade-plus, the above and other themes have behaved as threads intertwining to varying degrees, in multiple patterns, with one another and with the heightened environmental concern which emerged in the late 1960s to produce something, or some things, called *environmental education*. A few "newer" elements such as *energy education* and *marine-and-aquatic education* may be viewed as educational reponses to somewhat specific, emerging environment-related concerns, and are perceived by many as subsets of environmental education. Using the same reasoning, it is possible to speak of environmental education as a necessary component of *citizenship education*, and as a primary consideration of *global education*—depending in part, of course, on how they themselves are defined.

Metamorphosis

Bowman (1972), building on earlier work by Hone (1959), has taken the position that environmental education began as an outgrowth of, or metamorphosis from, an increasingly irrelevant conservation education:

> The transition from the conservation to the environmental movement is not clear cut. Conservation education interest began to wane in the late 1950s largely due to demographic changes that had taken place in our country. Conservation education programs which traditionally placed emphasis on renewable resources at the agricultural level had little appeal to a population that consisted predominantly of city dwellers . . . (p. 14)

Kirk (1977) has approached the transition from a different perspective:

> . . . in the late 1960s outdoor educators who had made the shift to attitude formation in conservation were beginning to feel a new set of societal pressures. These same pressures were being applied with equal force on those individuals active in conservation education. The pressures of the late 1960s, which were felt by the leaders in both outdoor education and conservation, were caused by an increased public awareness of the problems of air pollution, water pollution, noise pollution, landscape pollution, overpopulation, and excess energy demands. It soon became apparent that it was not possible for educators to focus solely on natural resource management and that it was necessary, when speaking about forest lands, woodlands, and open space, to make reference to life in the suburbs and cities. As the environmental problems increased in significance and number, an educational phenomenon began to take place. These external pressures in our society forced the philosophical components of outdoor education and conservation education on a collision course, and in the late 1960s there was a mixing and a blending which resulted in a great explosion or 'quantum jump' which produced a new product, a new philosophy, a new approach: environmental education. (p. 34)

By 1969, sufficient interest in environmental education as a "new," discrete entity had emerged to occasion the development of definitional statements. Not all felt, however, that it was necessary to do so:

> . . . to me the terms conservation education and environmental education are and always have been synonymous. The latter term is now in vogue. It's all right with me. I care not one bit what handle we give to the concept. I do care how we go about the job, for environmental education is just as amorphous a term as is conservation education, and is subject to just as many different interpretations (Clark, 1969:8).

It is probable that Clark's position has been and remains the view of many, particularly among practitioners. Nevertheless, definitions began to appear, perhaps because of identified needs such as those expressed by Helgeson, *et al.* (1971):

> The need for a framework for thinking about environmental problems seems clear. With the recent and current interest demonstrated throughout the nation in environmental problems, there is a bandwagon effect which tempts many individuals and groups to declare that their particular interest or program is at the heart of the environmental problem. It is true that

> 'everything is related to everything,' and it is also true that one of the great lessons to be learned from environmental problems is that some human actions and decisions have consequences which, although indirect and remote, may be cumulative and disastrous for human welfare. Nevertheless, it is absolutely essential that any problem area that is to be studied seriously, be limited in scope . . . (p. 3)

Table 1: Comparison of Characteristics of Earlier and Present Environment-Related Education (Schoenfeld, 1969)

Yesterday	Today
Compartmentalized	Comprehensive
Parochial interests	Broader awareness
Local	Global
Rural	Urban
Appended rationales	Indigenous concern
Evangelical	Ecological
Resource-centered	Man-centered
Terrestrial	Universal
Biophysical science	Social studies
Gospel of efficiency	Quest for quality
Technological impetus	Public involvement
Unilateral solutions	Open-ended options
Elementary education	Adult education
Print media	All media
Hunch	Research
Business as usual	Sense of urgency

Early Definitions

In addition to need and/or desire for definition, opportunity also emerged: Harvey (1976) has attributed much of the early proliferation of environmental education definitional statements to the 1969 debut of the quarterly *Environmental Education*, later (1970) renamed *The Journal of Environmental Education*, the first appropriately labelled forum for printed communications in the emerging area. The formation of the National Association for Environmental Education (1971) and the Alliance for Environmental Education (1973) provided additional opportunity.

Though he did not define the term, Schoenfeld as founding editor of the journal described it in the inaugural issue (1969) by reporting contrasting lists of characteristics between "old" and "new," as developed by graduate students in the University of Wisconsin's Conservation Communications Program (Table 1).

An early concise definition, one serving as the basis for many subsequent efforts, emerged from a graduate seminar in the Department of Resource Conservation and Planning of The University of Michigan's School of Natural Resources under the leadership of William Stapp; it also appeared in the first issue of *Environmental Education* (Stapp, *et al.*, 1969):

> Environmental education is aimed at producing a citizenry that is *knowledgeable* concerning the biophysical environment and its associated problems, *aware* of how to help solve these problems, and *motivated* to work toward their solution. (p. 54)

Seminar participants further suggested that "the major objectives of environmental education are to help individuals acquire:

> 1. A clear understanding that man is an inseparable part of a system, consisting of man, culture, and the biophysical environment, and that man has the ability to alter the interrelationships of this system . . .
>
> 2. A broad understanding of the biophysical environment, both natural and man-made, and its role in contemporary society . . .
>
> 3. A fundamental understanding of the biophysical environmental problems confronting man, how these problems can be solved, and the responsibility of citizens and government to work toward their solution . . .
>
> 4. Attitudes of concern for the quality of the biophysical environment which will motivate citizens to participate in biophysical environmental problem-solving. (p. 54)

In defining *environmental management education* as a necessary first step in identifying "fundamental concepts for environmental management education, K-16" Robert Roth (1970a, 1970b) modified the Stapp statement by referencing both biophysical and sociocultural environments and by stressing the management dimension, as follows:

> Environmental management education is the process of developing a citizenry that is:
>
> 1. knowledgeable of the interrelated biophysical and sociocultural environments of which man is a part;
>
> 2. aware of the associated environmental problems and management alternatives of use in solving these problems; and
>
> 3. motivated to work toward the maintenance and further development of diverse environments that are optimum for living. (1970b:65)

In 1972, McInnis specified the following as the "fundamental characteristics of effective environmental education;" he later (1975) used them as a platform to develop a discussion of *environmentalized education:*

> 1. That education is most environmental which most facilitates a direct encounter of the learner with the environment being learned.
>
> 2. Those environments are most educational which maximize the learner's potential capacities to function successfully as an intelligently integrating multi-sensory organism. (According to McInnis, "The key word here is 'intelligently,' which feature distinguishes the human organism from others. The use of 'integrat*ing*' rather than 'integrat*ed*' is also vital, since it indicates an ongoing process.") (p. 24)

Evolving Definitions

The above examples were selected for inclusion here as representative of the types of definitional statements appearing in the early literature; by no means do they constitute the complete set. The elements of definitions in current general use, along with those concerns which continue to make it difficult to arrive at definitional consensus, may be found within them. An added complication is that definitions of antecedents are still on occasion advanced as definitions of environmental education.

Few "new" definitions have appeared beyond those reported, but there have been a number of modifications, extensions, and re-considerations; some are treated below.

Brennan and Schoenfeld

Brennan (1970) furnished the following definition of environmental education, based upon earlier definitional discussions of conservation education supplied by Brandwein and himself:

> (Environmental education is) that education which develops in man a recoginition of his interdependence with all of life and a recognition of his responsibility to maintain the environment in a manner fit for life and fit for living—an environment of beauty and bounty, in which man lives in harmony. The first part of environmental education involves development of understanding; the second, development of attitudes—a 'conservation ethic.' (p. 2)

In 1973, Brennan re-stated his preference for the term conservative education, but acknowledged environmental

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education definitions which identified the same goals as those he associated with conservation education. In 1979, he questioned the effectiveness of environmental education as it had been practiced since its inception, stating that:

> There was never any intent to eliminate conservation from our purview, for conservation was, and is, our only reason for being in this business of environmental education. Yet that has been done; conservation has been eliminated. (p. 46)

Schoenfeld expressed similar concerns in a 1975 editorial, particularly with respect to the ways environmental education was being approached by the U. S. Office of Education. In 1980, he called for the initiation of *integrated environmental management education* as the proper touchstone for environmental education.

The Stapp Definition

The "Stapp definition" has been a basis for continuing discussion and expansion, by Stapp and others. His three-pronged statement of objectives—knowledge of environmental problems, awareness of possible solutions, and motivation to work toward solutions—has become to many an article of faith. However, Stapp (1970) has cautioned that educational research does not support the optimistic assumption that acquisition of information and skills will lead to positive changes in social behavior.

Because Stapp has exerted influence at an international level, further discussion of the "Stapp definition" is continued below under the *International/Global* heading.

The Roth Definition

Another analysis of R. Roth's concept list (Bowman, 1972), using a Q-sort technique, identified four major areas of concern: *biophysical* (living things are interdependent with one another and the environment); *sociocultural* (the relationships between man and the environment are mediated by culture); *environmental management* (the management of resources to meet the needs of successive generations demands long range planning); and *change* (organisms and environment are in constant change).

Bowman's model identified interrelationships between and among these areas, also specifying their interrelationships with the knowledge ("neutral") and values ("individual") dimensions of environmental education, re-inforcing the overall "quality of life" objective stressed by Roth. In 1973, Roth provided a modification of the Bowman model which dealt with both formal and nonformal approaches to environmental education and communication.

Environmental Literacy

The necessity of *environmental literacy* was clearly described by President Nixon in his August 1970 Environmental Message to Congress:

> It is also vital that our entire society develop a new understanding and a new awareness of man's relation to his environment—what might be called 'environmental literacy.' This will require the development and teaching of environmental concepts at every point in the educational process. (p. 11)

A number of applications of the environmental literacy concept have appeared since 1970, among them a statement of *The Fundamentals of Environmental Education* by the Subcommittee on Environmental Education of the U. S. Federal Interagency Committee on Education (1976), which included as its main topics "Fundamentals about Earth's Environment," "Fundamentals concerning Humans as Ecosystem Components," "Methods for Harmonizing Human Activities with Ecosystem Processes to Achieve Environmental Quality," and "Using Fundamentals of the Environment and Understanding the Methods."

U.S. Office of Education

Particularly targeted by the 1975 comments of Schoenfeld and the 1979 criticisms by Brennan were the applications of the Environmental Quality Education Act, commonly called the Environmental Education Act (U. S. Public Law 91-516, 1970), which Brennan said rejected funding proposals related to nature study, conservation, and outdoor education, and Schoenfeld noted did not support efforts of historically successful agencies and organizations. The Act offered this definition:

> For the purposes of this Act, the term 'environmental education' means the educational process dealing with man's relationship with his natural and manmade surroundings, and includes the relation of population, conservation, transportation, technology, and urban and regional planning to the total human environment. (p. 1)

As part of its preparation for implementation of the Act, the U. S. Office of Education (1970) published the following:

> Environmental education is a study of the factors influencing ecosystems, mental and physical growth, living and working conditions, decaying cities, and population pressures. Environmental education is intended to promote among citizens the awareness and understanding of the environment, our relationship to it, and the concern and responsible action necessary to assure our survival and to improve the quality of life . . .
>
> It is important to understand that environmental education is much more than a schoolhouse approach to ending the degradation of man's surroundings and the pollution and destruction of the natural world. Environmental education will not simply provide the nation with skills to meet or solve those problems. It is not merely a course in school or a curriculum combining elements of the natural and physical sciences into a new department of specialty. Nor is it just another name for outdoor education, resource management, or conservation education.
>
> Environmental education provides alternate ways of thinking—a synthesis—which colors and affects the humanities, languages, social sciences, history, economics, and religion as dramatically as it does the natural sciences. It will give an ecological perspective for every aspect of learning. (pp. 10-11)

In 1973 Walter Bogan, at the time director of the U. S. Office of Education's Office of Environmental Education, commented: "A completely acceptable definition of environmental education has not yet been found, for environmental education is a relatively new activity still undergoing important developments in its practical application and theoretical foundation." (p. 1) He proposed two working definitions:

1. (emphasizing process and theory):

> . . . the process of environmental education helps the learner perceive and understand environmental principles and problems, and enables him to identify and evaluate the possible alternative solutions to these problems and assess their benefits and risks. It involves the development of skills and insights needed to understand the structure, requirements, and impact of interactions within and among various environmental amenities, subsystems, and systems.

2. (emphasizing content and purposes):

> . . . environmental education is the process of inquiry into both the specific and general environmental implications of human activities viewed from the perspective of social needs and values as they relate to general public policy. (pp. 1-2)

In a similar vein, Tanner (1974) commented:

> Ultimately, we believe, environmental education must focus on the Spaceship Earth concept. It

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> must deal with man-man or man-society relationships only as they affect, or are affected by, man-earth relationships. Other endeavors, worthwhile though they may be, are not environmental education. To be useful, a concept must be both inclusive *and* exclusive. (p. 84)

International/Global

Recommendation 96 of the 1972 Stockholm Conference on the Human Environment called for the development of environmental education as one of the most critical elements of an all-out attack on the world's environmental crisis. A need identified at that conference (United Nations, 1972) was:

> Creating citizenries not merely aware of the crisis of overpopulation, mismanagement of natural resources, pollution, and degradation of the quality of human life, but also able to focus intelligently on the means of coping with them. (p. 7)

A report (Barry, 1976) in the first issue of the Unesco-UNEP environmental education newsletter *Connect* reported this goal statement from the October 1975 International Environmental Education Workshop at Belgrade, Yugoslavia:

> The goal of environmental education is to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones. (p. 2)

The same article listed the following as objectives for environmental education: awareness, knowledge, attitude, skills, evaluation ability, and participation.

In 1979, Stapp, *et al.*, emphasized that "the evolving goal of environmental education is to foster an environmentally literate global citizenry that will work together in building an acceptable quality of life for all people." (p. 92) They further stated that

> the basic aim of environmental education as defined by the participants of the 1977 Unesco-UNEP Intergovernmental Conference on Environmental Education (held in Tbilisi, Georgia, USSR) is:
>
> > . . . to succeed in making individuals and communities understand the complex nature of the natural and built environments resulting from the interaction of their physical, biological, social, economic, and cultural aspects, and acquire the knowledge, values, attitudes, and practical skills to participate in a responsible and effective way in anticipating and solving environmental problems, and in the management of the quality of the environment. (p. 92)

Cowan and Stapp (1982) have further explored this theme, documenting it with a set of case studies collected from around the world.

Research Studies

With the primary exceptions of those definitions generated by Robert Roth and his students, the preponderance of the definitions cited above fit into the categories of philosophical statements and/or arguments for previously-held positions. However, three additional doctoral-level research studies reported during the 1970s focused specifically on defining environmental education in terms of goals, perspectives, and structure.

Relationships between and among the goals of *environmental education, ecological education, outdoor education, conservation education, environmentalized education*, and *general education* were evaluated in a 1977 study by Johnson. Using goal statements from the literature of each field and a Q-sort procedure, 65 selected individuals representing the six areas rank-ordered the statements. Goals describing man's relationship to and utilization of the environment were ranked high by all groups; environmental educators, environmentalized educators, and conservation educators ranked many of the same goals highest. A model developed to illustrate the relationships among the six groups showed environmental education overlapping the five other areas, with especially strong overlaps with conservation education and environmentalized education. The study also illustrated the uniqueness of ecological education, general education, and outdoor education.

A perceptive analysis of environmental education in terms of perspectives has been reported by Lucas (1972, 1980, 1980-81). Based on a detailed analysis of the early literature of environmental education and enhanced by rigorous application of the principles of logic, he argued that:

> . . . uses of the term environmental education can be classified into education *about* the environment, education *for* (the preservation of) the environment, education *in* the environment, and the classes formed by the combinations *about* and *for*, *about* and *in*, and *about*, *for*, and *in*. Education *about* the environment, which is concerned with providing cognitive understanding including the development of skills necessary to obtain this understanding, and education *for* the environment, which is directed environmental preservation or preservation for particular purposes, are charactized by their aims; education *in* the environment . . . is characterized by a technique of instruction. In the *in* case, environment usually means the world outside the classroom, and in the other usages it usually refers to the biophysical and/or social context in which groups of people . . . exist . . .
>
> The Belgrade Charter adopted . . . in 1975 includes a statement of the goal of environmental education which is very clearly *for* the environment . . . (1980-81:33-34)

Harvey's study (1976, 1977) attempted to determine if a generally accepted definition and a generally accepted model or delineation of substantive structure existed. His thorough review of the literature, including most though not all of the sources cited above through 1976 and also including a number of definitions and models not cited here, demonstrated that none existed, so he undertook their development. Through use of key word and key phrase analysis of existing definitions, the following "mediating definition" was constructed:

> (Environmental education is) an interdisciplinary, integrated process concerned with resolution of values conflicts related to the man-environment relationship, through development of a citizenry with awareness and understanding of the environment, both natural and man-altered. Further, this citizenry will be able and willing to apply enquiry skills, and implement decision-making, problem-solving, and action strategies toward achieving/maintaining homeostasis between quality of life and quality of environment. (1976:158)

A similar procedure was used to construct a generic substantive structure, employing three basic components—philosophy, precept, and expected outcome—to subsume those elements identified by 49 models purporting to describe environmental education and/or its facets. The first component, philosophy, was perceived to be "Spaceship Earth," with a "lifeboat concept" frame of reference. As detailed by Harvey, "Spaceship Earth" includes man, environment, and relationship as major components, while the "lifeboat concept" provides a values/ethical orientation.

The second component of Harvey's structure, its precept, is conceptualized as the people-environment relationship (PER), operating in a values-laden context. PER is defined as:

> . . . the consideration of, planning for, and implementation of natural

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> resource use by human beings; the resultant products and processes; and implications for impact on the environment reflected in each person's perception of an acceptable quality of life. (1977:67)

Harvey identified as the expected outcome of environmental education "environmental literacy," which he defined at three levels—environmentally literate, environmentally competent, and environmentally dedicated. These levels may be interpreted as being comparable to Stapp's 1969 three-part statement of objectives.

As an interesting outcome of his study, Harvey concluded that the term *environmental education* is a misnomer, based on his observation that the terminologies most often appearing in the professional literature would lead to *person-environment relationship education* (PERE), defined thusly, as the appropriate term:

> (PERE is) the process of developing an environmentally literate, competent, and dedicated citizenry which actively strives to resolve values conflicts in the person-environment relationship, in a manner which is ecologically and humanistically sound, in order to reach the superordinate goal of a homeostasis between quality of life and quality of environment. (1977:68)

He further noted that much of the environmental education literature is not about the person-environment relationship as defined, but about "person-environment relationship foundations" (PERF), which are:

> . . . topics which provide learnings (psychomotor, cognitive, or affective) about the people-environment relationship, in a non-values laden context, which are prerequisite, or complementary, to PERE. (1977:70)

In expansion of his definition of PERF, Harvey indicated that "People-focused foundations are topics which have as a main focus the human being, either individually or collectively," "Environment-focused foundations are topics which have as a main focus the biophysical environment and its systems," and "Relationship-focused foundations are topics which have as their main focus the relationship between human beings and the earth, as well as the products/processes resultant from that interaction . . . in a non-values-laden context." (1977:70)

Summary

That unanimity of agreement concerning *the* definition of environmental education has not been reached was clearly demonstrated by an editorial footnote in a recent issue of *The Journal of Environmental Education* (Editor, 1982), which said:

> This editorial seemed to succeed quite well in suggesting real parameters for a well-known type of educational endeavor. Environmental education is now well over a decade old. Can we define it as well? Do we need to? (p. 3)

Hungerford, *et al.* (1983), said in response, referencing their work and Harvey's:

> It is disconcerting (to say the least) for those involved in the implementation of environmental education goals to hear again the question: 'What is environmental education?' . . . We submit that environmental education does have a substantive structure that has evolved through the considerable efforts of many and that the framework has been documented formally in the literature. The question asked . . . has most certainly been answered. One would dare hope that this question could, at long last, be laid to rest . . . the field is quite definitely beyond the goal setting stage and into the business of implementation. (p. 2)

It appears that Harvey's mediating definition and structural model have in fact subsumed the substance of earlier definitions and models; it also appears that no definitions or models proposed since the completion of his work in 1976 are at variance. The same might also be said with respect to Lucas' "in, about, and for" analysis, and to Johnson's definitional study. But these works do clearly lie "mostly unattended by professionals" (Hungerford, *et al.*, 1983:2).

Two possible reasons for this situation were suggested in the early paragraphs of this paper. A third possibility is a manifestation of what Schafer (1979) has called "the dung heap syndrome"—territoriality, or turf protection. Any of them may be *the* reason; it is more likely that they are three contributing reasons.

In any case, the basic problem appears to be one of communications—either those concerned are not aware of what each other are saying, or they choose not to acknowledge, discuss, or debate it, for whatever reasons. A number of apparently viable definitions and models have been advanced; Harvey has provided an analysis of most of them, and proposed a middle ground. Thus, it would appear that the groundwork has been laid for dialogue, early agreement, and "getting on with it."

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"Producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution."

THE CONCEPT OF ENVIRONMENTAL EDUCATION

William B. Stapp, et. al.

WITHIN THE past 50 years, the United States has become a predominately urban nation, both in thought and in physical character. Large and middle-sized communities, many within complex urban regions, have evolved to where over 70 percent of this country's population resides on one and one-half percent of the nation's land surface. By 1980, eight out of ten Americans will probably live in an urban environment. Consequently, the independent rural-oriented living that once characterized this country's social and political heritage is no longer a dominating influence in the lives of most Americans.

In rural surroundings, direct daily contact with the basic natural resources was prevalent, especially within man's immediate environment. As man became progressively urbanized, his intimate association and interaction with natural resources diminished and, with it his awareness of his dependency on them. Yet, it is imperative that man, wherever he lives, comprehend that his welfare is dependent upon the proper management and use of these resources.

Man should also have an awareness and understanding of his community and its associated problems. Our communities are being plagued with problems such as: lack of comprehensive environmental planning; indiscriminate use of pesticides; community blight; air and water pollution; traffic congestion; and the lack of institutional arrangements needed to cope effectively with environmental problems. While these problems are legitimate concerns of community governmental officials and planners, the responsibility for their solution rests, to a large extent, with citizens.

To an increasing extent citizens are being asked to make decisions that affect (directly and indirectly) their environment. Specifically, citizens make these decisions as they cast votes on community issues; as they elect representatives to policy-making bodies; as they directly act upon the environment itself. Citizens can be effective in influencing sound policy in other ways. They can ask informed questions, at the proper time, of the right people. They can serve on advisory and policy-making committees. They can support sound legislation directed at resolving environmental problems. To perform these tasks effectively, it is vital that the citizenry be knowledgeable concerning their biophysical environment and associated problems, aware of how they can help solve these problems, and motivated to work toward effective solutions.

Most current programs in conservation education are oriented primarily to basic resources; they do not focus on community environment and its associated problems. Furthermore, few programs emphasize the role of the citizen in working, both individually and collectively, toward the solution of problems that affect our well being. There is a vital need for an educational approach that effectively educates man regarding his relationship to the total environment.

The Supreme Court decision regarding the one-man, one-vote concept, is enabling the increasing urban majority to acquire greater powers in decision-

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The definition and major objectives of environmental education presented in this paper were developed in a graduate seminar in the Department of Resource Planning and Conservation, School of Natural Resources, The University of Michigan. The members of the seminar were: Mr. Dean Bennett, Mr. William Bryan, Jr., Mr. Jerome Fulton, Miss Jean Mac Gregor, Mr. Paul Nowak, Mr. James Swan, Mr. Robert Wall, and Professors Spenser Havlick and William B. Stapp.

making, makes it imperative that programs developed for urbanites be designed with them in mind. It is important to assist each individual, whether urbanite or ruralite, to obtain a fuller understanding of the environment, problems that confront it, the interrelationship between the community and surrounding land, and opportunities for the individual to be effective in working toward the solution of environmental problems.

This new approach, designed to reach citizens of all ages, is called ''environmental education.'' We define it in this way:

Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution.

The major objectives of environmental education are to help individuals acquire:

1. A clear understanding that man is an inseparable part of a system, consisting of man, culture, and the biophysical environment, and that man has the ability to alter the interrelationships of this system.

The principal feature of the philosophy of environmental education is that man is an integral part of a system from which he cannot be separated. Specifically, this system consists of three components, man, culture, and the biophysical environment. Culture, in this context, incorporates organizational strategies, technological processes, and social arrangements (political, legal, managerial, educational, etc.) through which man interacts with the biophysical environment. The biophysical environment designates both the natural and man-made components of the environment.

The fundamental relationship between the integral parts of the system is man's interaction through culture on the biophysical environment to produce or obtain the goods and services that he needs.

Within the system, man has the ability either to strengthen, weaken, or maintain the interrelationships between the system's major components. The ultimate goal of environmental education is the development and maintenance of a high quality system in which man interacts through culture on the biophysical environment to advance human welfare.

2. A broad understanding of the biophysical environment, both natural and man-made, and its role in contemporary society.

The existence of any civilization is dependent upon man's use of natural resources. Resources are defined as those parts of the biophysical environment which are appraised by man as being immediately or potentially useful to him.

A basic understanding of natural resources ideally includes their characteristics, distribution, status, interrelationships, and their present and potential uses. Natural resources serve man in many ways, whether in a relatively undisturbed condition or in the highly altered utilitarian forms of the man-made biophysical environment. A strong understanding of how these resources are used requires knowledge of the social, political, economic, technological processes, institutional arrangements, and aesthetic considerations which govern their utilization.

The man-made components of the biophysical environment results from man's use of natural resources. An understanding of this aspect is also essential: it should ideally include familiarity with urban and rural design, including transportation systems, spatial patterns of development, and aesthetic qualities which have a major impact on the functioning of society. Fundamental to these understandings should be the realization that the development of the man-made environment should strive for a high quality system which improves human welfare in relation to the natural environment.

3. A fundamental understanding of the biophysical environmental problems confronting man, how these problems can be solved, and the responsibility of citizens and government to work toward their solution.

Biophysical environmental problems result from the interractions between man, culture, and the biophysical environment. Pollution, the inefficient utilization and management of natural resources, the indiscriminate use of pesticides, urban blight, and transportation congestion are just a few biophysical environmental problems. These problems, caused by a complex set of biological, physical, and social factors, affect the total environmental system.

Citizens need to understand how to work toward solutions of biophysical environmental problems through laws, public policies, planning, resource management, research, technological developments, and institutional arrangements.

Citizens should realize that the responsibility for solutions to these problems belongs to them and the governments which represent them.

4. Attitudes of concern for the quality of the biophysical environment which will motivate citizens to participate in biophysical environmental problem-solving.

The word ''attitude'' used in this context implies more than simply the knowledge of a body of factual information. Instead, it implies a combination of factual knowledge and motivating emotional concern which result in a tendency to act. Further, it is understood that clusters of attitudes about similar environmental conditions will motivate individuals to express their attitudes. Therefore, for environmental education to achieve its greatest impact, it must: 1) provide factual information which will lead to understanding of the total biophysical environment; 2) develop a concern for environmental quality which will motivate citizens to work toward solutions to biophysical environmental problems; and 3) inform citizens as to how they can play an effective role in achieving the goals derived from their attitudes.

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"Producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution."

THE CONCEPT OF ENVIRONMENTAL EDUCATION

William B. Stapp et al

WITHIN THE past 50 years, the United States has become a predominately urban nation, both in thought and in physical character. Large and middle-sized communities, many within complex urban regions, have evolved to where over 70 percent of this country's population resides on one and one-half percent of the nation's land surface. By 1980, eight out of ten Americans will probably live in an urban environment. Consequently, the independent rural-oriented living that once characterized this country's social and political heritage is no longer a dominating influence in the lives of most Americans.

In rural surroundings, direct daily contact with the basic natural resources was prevalent, especially within man's immediate environment. As man became progressively urbanized, his intimate association and interaction with natural resources diminished and, with it his awareness of his dependency on them. Yet, it is imperative that man, wherever he lives, comprehend that his welfare is dependent upon the proper management and use of these resources.

Man should also have an awareness and understanding of his community and its associated problems. Our communities are being plagued with problems such as: lack of comprehensive environmental planning; indiscriminate use of pesticides; community blight; air and water pollution; traffic congestion; and the lack of institutional arrangements needed to cope effectively with environmental problems. While these problems are legitimate concerns of community governmental officials and planners, the responsibility for their solution rests, to a large extent, with citizens.

To an increasing extent citizens are being asked to make decisions that affect (directly and indirectly) their environment. Specifically, citizens make these decisions as they cast votes on community issues; as they elect representatives to policy-making bodies; as they directly act upon the environment itself. Citizens can be effective in influencing sound policy in other ways. They can ask informed questions, at the proper time, of the right people. They can serve on advisory and policy-making committees. They can support sound legislation directed at resolving environmental problems. To perform these tasks effectively, it is vital that the citizenry be knowledgeable concerning their biophysical environment and associated problems, aware of how they can help solve these problems, and motivated to work toward effective solutions.

Most current programs in conservation education are oriented primarily to basic resources; they do not focus on community environment and its associated problems. Furthermore, few programs emphasize the role of the citizen in working, both individually and collectively, toward the solution of problems that affect our well being. There is a vital need for an educational approach that effectively educates man regarding his relationship to the total environment.

The Supreme Court decision regarding the one-man, one vote concept, is enabling the increasing urban majority to acquire greater powers in decision-making, makes it imperative that programs developed for urbanites be designed with them in mind. It is important to assist each individual, whether urbanite or ruralite, to obtain a fuller understanding of the environment, problems that confront it, the interrelationship between the community and surrounding land, and opportunities for the individual to be effective in working toward the solution of environmental problems.

This new approach, designed to reach citizens of all ages, is called "environmental education." We define it in this way:

Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution.

The major objectives of environmental education are to help individuals acquire:

1. A clear understanding that man is an inseparable part of a system, consisting of man, culture, and the biophysical environment, and that man has the ability to alter the interrelationships of this system.

The principal feature of the philosophy of environmental education is that man is an integral part of a system from which he cannot be separated. Specifically, this system consists of three components, man, culture, and the biophysical environment. Culture, in this context, incorporates organizational strategies, technological processes, and social arrangements (political, legal, managerial, educational, etc.) through which man interacts with the biophysical environment. The biophysical environment designates both the natural and man-made components of the environment.

The fundamental relationship between the integral parts of the system is man's interaction through culture on the biophysical environment to produce or obtain the goods and services that he needs.

Within the system, man has the ability either to strengthen, weaken, or maintain the interrelationships between the system's major components. The ultimate goal of environmental education is the development and maintenance of a high quality system in which man interacts through culture on the biophysical environment to advance human welfare.

2. A broad understanding of the biophysical environment, both natural and man-made, and its role in contemporary society.

The existence of any civilization is dependent upon man's use of natural resources. Resources are defined as those parts of the biophysical environment which are appraised by man as being immediately or potentially useful to him.

A basic understanding of natural resources ideally includes their characteristics, distribution, status, interrelationships, and their present and potential uses. Natural resources serve man in many ways, whether in a relatively undisturbed condition or in the highly altered utilitarian forms of the man-made biophysical environment. A strong understanding of how these resources are used requires knowledge of the social, political, economic, technological processes, institutional arrangements, and aesthetic considerations which govern their utilization.

The man-made components of the biophysical environment results from man's use of natural resources. An understanding of this aspect is also essential: it should ideally include familiarity with urban and rural design, including transportation systems, spatial patterns of development, and aesthetic qualities which have a major impact on the functioning of society. Fundamental to these understandings should be the realization that the development of the man-made environment should strive for a high quality system which improves human welfare in relation to the natural environment.

3. A fundamental understanding of the biophysical environmental problems confronting man, how these problems can be solved, and the responsibility of citizens and government to work toward their solution.

Biophysical environmental problems result from the interractions between man, culture, and the biophysical environment. Pollution, the inefficient utilization and management of natural resources, the indiscriminate use of pesticides, urban blight, and transportation congestion are just a few biophysical environmental problems. These problems, caused by a complex set of biological, physical, and social factors, affect the total environmental system.

Citizens need to understand how to work toward solutions of biophysical environmental problems through laws, public policies, planning, resource management, research, technological developments, and institutional arrangements.

Citizens should realize that the responsibility for solutions to these problems belongs to them and the governments which represent them.

4. Attitudes of concern for the quality of the biophysical environment which will motivate citizens to participate in biophysical environmental problem-solving.

The word "attitude" used in this context implies more than simply the knowledge of a body of factual information. Instead, it implies a combination of factual knowledge and motivating emotional concern which result in a tendency to act. Further, it is understood that clusters of attitudes about similar environmental conditions will motivate individuals to express their attitudes. Therefore, for environmental education to achieve its greatest impact, it must: 1) provide factual information which will lead to understanding of the total biophysical environment; 2) develop a concern for environmental quality which will motivate citizens to work toward solutions to biophysical environmental problems; and 3) inform citizens as to how they can play an effective role in achieving the goals derived from their attitudes.

The definition and major objectives of environmental education presented in this paper were developed in a graduate seminar in the Department of Resource Planning and Conservation, School of Natural Resources, The University of Michigan. The members of the seminar were: Mr. Dean Bennett, Mr. William Bryan, Jr., Mr. Jerome Fulton, Miss Jean MacGregor, Mr. Paul Nowak, Mr. James Swan, Mr. Robert Wall, and Professors Spenser Havlick and William B. Stapp.

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III. DECLARATION AND RECOMMENDATIONS OF THE CONFERENCE

A. DECLARATION OF THE TBILISI INTERGOVERNMENTAL CONFERENCE ON ENVIRONMENTAL EDUCATION

The Intergovernmental Conference on Environmental Education, organized by Unesco in co-operation with UNEP, convened in the City of Tbilisi reflecting the harmony and consensus achieved there, solemnly adopts the following Declaration.

In the last few decades, man has, through his power to transform his environment, wrought accelerated changes in the balance of nature. The result is frequent exposure of living species to dangers which may prove irreversible.

The Declaration of the United Nations Conference on Human Environment organized in Stockholm in 1972 proclaimed: "to defend and improve the environment for present and future generations has become an imperative goal for mankind". This undertaking urgently calls for new strategies, incorporated into development, which particularly in the developing countries is a prerequisite for any such improvement. Solidarity and equity in the relations between nations should constitute the basis of a new international order, and bring together, as soon as possible, all available resources. Education utilizing the findings of science and technology should play a leading role in creating an awareness and a better understanding of environmental problems. It must foster positive patterns of conduct towards the environment and the nations' use of their resources.

Environmental education should be provided for all ages, at all levels and in both formal and non-formal education. The mass media have a great responsibility to make their immense resources available for this educational mission. Environmental specialists as well as those whose actions and decisions can have a marked effect on the environment, should be provided in the course of their training with the necessary knowledge and skills and be given a full sense of their responsibilities in this respect.

Environmental education, properly understood, should constitute a comprehensive lifelong education, one responsive to changes in a rapidly changing world. It should prepare the individual for life through an understanding of the major problems of the contemporary world, and the provision of skills and attributes needed to play a productive role towards improving life and protecting the environment with due regard given to ethical values. By adopting a holistic approach, rooted in a broad interdisciplinary base, it recreates an overall perspective which acknowledges the fact that natural environment and man-made environment are profoundly interdependent. It helps reveal the enduring continuity which links the acts of today to the consequences for tomorrow. It demonstrates the interdependencies among national communities and the need for solidarity among all mankind.

Environmental education must look outward to the community. It should involve the individual in an active problem-solving process within the context of specific realities, and it should encourage initiative, a sense of responsibility and commitment to build a better tomorrow. By its very nature, environmental education can make a powerful contribution to the renovation of the educational process.

In order to achieve these goals, environmental education requires a number of specific actions to fill the gaps that, despite outstanding endeavours, continue to exist in our present education systems.

Accordingly, the Tbilisi Conference:

Appeals to Member States to include in their educational policies measures designed to introduce environmental concerns, activities and contents into their education systems, on the basis of the above objectives and characteristics;

Invites educational authorities to promote and intensify thinking, research and innovation in regard to environmental education;

Urges Member States to collaborate in this field, in particular by exchanging experiences, research findings, documentation and materials and by making their training facilities widely available to teachers and specialists from other countries; and

Appeals, lastly, to the international community to give generously of its aid in order to strengthen this collaboration in a field which symbolizes the need for solidarity of all peoples and may be regarded as particularly conducive to the promotion of international understanding and to the cause of peace.

B. RECOMMENDATIONS

THE ROLE, OBJECTIVES AND GUIDING PRINCIPLES OF ENVIRONMENTAL EDUCATION

Recommendation No.1

The Conference,

Considering the challenge that environmental problems present to contemporary society and having regard for the role that education can and must play in solving such problems,

Recommends the adoption of certain criteria which will help to guide efforts to develop environmental education at the national, regional and international levels.

1. Whereas it is a fact that biological and physical features constitute the natural basis of the human environment, its ethical, social, cultural and economic dimensions also play their part in determining the lines of approach and the instruments whereby people may understand and make better use of natural resources in satisfying their needs.

2. Environmental education is the result of the reorientation and dovetailing of different disciplines and educational experiences which facilitate an integrated perception of the problems of the environment, enabling more rational action, capable of meeting social needs, to be taken.

3. A basic aim of environmental education is to succeed in making individuals and communities understand the complex nature of the natural and the built environments resulting from the interaction of their biological, physical, social, economic and cultural aspects, and acquire the knowledge, values, attitudes, and practical skills to participate in a responsible and effective way in anticipating and solving environmental problems, and the management of the quality of the environment.

4. A further basic aim of environmental education is clearly to show the economic, political and ecological interdependence of the modern world, in which decisions and actions by the different countries can have international repercussions. Environment should, in this regard, help to develop a sense of responsibility and solidarity among countries and regions as the foundation for a new international order which will guarantee the conservation and improvement of the environment.

5. Special attention should be paid to understanding the complex relations between socio-economic development and the improvement of the environment.

6. For this purpose, environmental education should provide the necessary knowledge for interpretation of the complex phenomena that shape the environment, encourage those ethical, economic and aesthetic values which, constituting the basis of self-discipline, will further the development of conduct compatible with the preservation and improvement of the environment; it should also provide a wide range of practical skills required in the devising and application of effective solutions to environmental problems.

7. To carry out these tasks, environmental education should bring about a closer link between educational processes and real life, building its activities around the environmental problems that are

faced by particular communities and focusing analysis on these by means of an interdisciplinary, comprehensive approach which will permit a proper understanding of environmental problems.

8. Environmental education should be regarded as a continuing process providing its recipients, through the constant renewal of its approach, content and methods, with knowledge that is always attuned to the changing conditions of the environment.

9. Environmental education should cater to all ages and socio-professional groups in the population. It should be addressed to (a) the general non-specialist public of young people and adults whose daily conduct has a decisive influence on the preservation and improvements of the environment; (b) to particular social groups whose professional activities affect the quality of the environment; and (c) to scientists and technicians whose specialized research and work will lay the foundations of knowledge on which education, training and efficient management of the environment should be based.

10. To achieve the effective development of environmental education, full advantage must be taken of all public and private facilities available to society for the education of the population; the formal education system, different forms of non-formal education, and the mass media.

11. To make an effective contribution towards improving the environment, educational action must be linked with legislation, policies, measures of control and the decisions that governments may adopt in relation to the human environment.

Recommendation No.2

The Conference,

Recognizing that environmental education should promote the strengthening of peace, the further relaxation of international tensions and mutual understanding among States and be a real instrument for international solidarity and for elimination of all forms of racial, political and economic discrimination,

Noting that the concept of "the environment" includes a complex of natural, built and social components in the life of humanity and that the social components constitute a set of cultural, moral, personal values and interrelations of people in the spheres of labour and leisure activities,

Taking note of document UNESCO/ENVED/4 "Education and the challenge of environmental problems", and in particular of the principles contained in Chapter II,

Having furthermore noted the Synthetic Report of the Regional Meeting of Experts on Environmental Education (ENVED/7, Chapter III, paragraphs 15-26),

Pursuant to the working document UNESCO/ENVED/4, paragraph 67, in which the Conference is invited to formulate goals, objectives and guiding principles which environmental education should have in order to fulfil its functions most effectively,

Considering that it should be a right of every citizen to receive environmental education,

Endorses the following goals, objectives and guiding principles for environmental education:

1. The goals of environmental education are:

   (a) to foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas;

   (b) to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;

   (c) to create new patterns of behaviour of individuals, groups and society as a whole towards the environment;

2. The categories of environmental education objectives:

   Awareness: to help social groups and individuals acquire an awareness of and sensitivity to the total environment and its allied problems.

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Knowledge: to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associate problems.

Attitudes: to help social groups and individuals acquire a set of values and feelings of concern for the environment, and the motivation for actively participating in environmental improvement and protection.

Skills: to help social groups and individuals acquire the skills for identifying and solving environmental problems.

Participation: to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems.

3. Some guiding principles for environmental education:

Environmental education should:

- consider the environment in its totality - natural and built, technological and social (economic, political, technological, cultural-historical, moral, aesthetic);
- be a continuous lifelong process, beginning at the pre-school level and continuing through all formal and non-formal stages;
- be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic and balanced perspective;
- examine major environmental issues from local, national, regional and international points of view so that students receive insights into environmental conditions in other geographical areas;
- focus on current and potential environmental situations, while taking into account the historical perspective;
- promote the value and necessity of local, national and international co-operation in the prevention and solution of environmental problems;
- explicitly consider environmental aspects in plans for development and growth;
- enable learners to have a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences;
- relate environmental sensitivity, knowledge, problem-solving skills and values clarification to every age, but with special emphasis on environmental sensitivity to the learner's own community in early years;
- help learners discover the symptoms and real causes of environmental problems;
- emphasize the complexity of environmental problems and thus the need to develop critical thinking and problem-solving skills;
- utilize diverse learning environments and a broad array of educational approaches to teaching/learning about and from the environment with due stress on practical activities and first-hand experience.

Recommendation No.3

The Conference,

Considering that the broader conception of development to which all people now subscribe includes the environment as one of its basic components,

Considering that environmental questions would accordingly be best approached and dealt with in relation to the overall policies applied by governments in regard to national development and in regard to international relations in the attempt to establish a new international order,

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Considering that the environment concerns all men and women in every country and that its preservation and improvement require the support and active participation of the population of those countries,

Believing that education at all levels is necessary to this end,

Recommends to Member States:

That they integrate environmental education into their general policy and, in accordance with their national structure, take appropriate measures in order, more especially to:

- sensitize public opinion to environmental problems and to major projects in course of execution or being planned;
- develop more detailed general information which will give an overview of major problems, the possibility of dealing with them and the respective urgency of the various measures taken or to be taken;
- encourage action within the family and in associations concerned with pre-primary education for the environmental education of young children, of pre-school age in particular;
- assign a central role to the school in the whole system of environmental education and organize, for this purpose, systematic action in primary and secondary education;
- expand environmental studies at the higher education level;
- establish the means and methods for an in-service training policy which will provide the additional and, more especially, practical training that may be required by those who, in different capacities, exercise responsibility in the public or private sectors in regard to the environment;
- seek, by means of environmental education, gradually to transform attitudes and behaviour so that all members of the community may be made aware of their responsibilities in the thinking through formulation and application of national or international environmental programmes;
- contribute thereby to the search for a new ethic based on respect for nature, for people and for their dignity, and for the future, and on the need for a quality of life to which all will have access and in which all will feel themselves involved.

Recommends to the Director-General of Unesco:

That he should provide technical aid to those Member States which are as yet without national environmental education structures, with a view to the formulation and execution of a suitable programme concerning this problem;

That he should foster the gradual incorporation of the system thus created into the framework of regional and international co-operation.

Recommendation No.4

The Conference,

Considering the need to stress not only the socio-economic aspects suitably set forth in the Unesco document but also the ecological aspects of the natural and human environment, which are of the utmost importance for both theoretical and practical environmental education,

Considering that the environment constitutes a system,

Considering that the human environment, like any other ecosystem, has its own structure, operation and history,

Considering that the causes of the ecological crisis must be sought at a deeper level, in certain aspects of these same socio-economic factors, namely:

- in a mistaken ethical conception of the relationship between humanity and nature,
- in a diminution, due to an extreme positivism, of the unitary nature of the scientific vision of reality,

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Recommends to the Member States that, in respect to formal and non-formal environmental education, they:

- promote deeper understanding of the natural aspects of the environment;
- develop a systems approach to the analysis and management of natural and human ecosystems;
- take into consideration the temporal (past, present and future) dimension of each environment.

Recommendation No.5

The Conference,

Recommends that governments systematically evaluate the environmental impact of development activities, and requests that development assistance strategies and programmes provide opportunities for countries to establish environmental training programmes which include the evaluation of development from the standpoint of the human environment.

STRATEGIES FOR THE DEVELOPMENT OF ENVIRONMENTAL EDUCATION AT THE NATIONAL LEVEL

Organizational structure

Recommendation No.6

It is recommended to Member States that, as far as possible, each country strengthen or set up the appropriate organizational structures which among others should have the functions listed below. It would be up to each government to decide as to the membership of the structure which might include representatives of educational and environmental protection authorities, practising teachers at different levels, organizations concerned nationally with environmental education and the mass media. Among the functions would be:

- to facilitate relationships with Unesco, UNEP and other organizations involved in environmental education;
- to co-ordinate initiatives in environmental education;
- to serve as a consultative body in environmental education at the governmental level;
- to play a role as a clearing-house and information centre in environmental education and training;
- to develop in various social and occupational groups an awareness and knowledge about the issues associated with environmental education in the country;
- to promote collaborative relationships among environmental education associations, citizen groups, and the scientific, research and education communities;
- to provide more frequent opportunities for meetings of those with political and administrative responsibilities with such groups and associations;
- to provide frameworks and guidelines for the establishment of environmental education action committees within the country;
- to assess the need for research, development and evaluation in environmental education;
- to encourage and facilitate the contribution to environmental education programmes of non-governmental organizations, including voluntary bodies.

The aim of the structure would be to adapt the recommendations of the Unesco Intergovernmental Conference on Environmental Education to national and local conditions, and to aid governments to implement the recommendations.

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Goals for Curriculum Development in Environmental Education

HAROLD HUNGERFORD, R. BEN PEYTON AND RICHARD J. WILKE

Environmental education (EE) has made numerous advances along a number of fronts over the past decade. The state-of-the-art with respect to the development of goals for curriculum development, however, has largely remained stable with a few notable exceptions including Harvey, Stapp, and the Tbilisi Intergovernmental Conference (4, 11, 12). Further, there exists no research providing a comprehensive description of EE program(s) or project curricula developed and implemented in the nation's elementary and secondary schools (3). This lack of knowledge results in curriculum development which is largely intuitive in nature without a cohesive strategy to guide developers toward goals which would facilitate the production of a citizenry competent to cope successfully with environmental issues.

The writers believe that the responsibilities of environmental education are too great . . . the time is too short . . . and practioners' skills too few to allow curriculum development to remain a matter of intuition. Environmental educators must learn from the mistakes made by conservation educators, or as Hobart stated,

> *lacking a coordinated, comprehensive, and uniform base, environmental education too will grind to a halt, axle deep in the same stuff that buried conservation education, for the failures of conservation education were rooted in the lack of its foundation (5).*

Concern about this lack of foundation for environmental education was expressed as early as 1970 by Clay Schoenfeld, then editor of *The Journal of Environmental Education.* Schoenfeld noted at the time that environmental education was at a stage of development which was passed long ago by many other areas of study, i.e., there is no clearly defined and delineated substantive structure for environmental education. In preparation for the 1975 Belgrade International Workshop on Environmental Education fourteen state-of-the-art papers were prepared by recognized authorities. In one of these papers, *The Nature and Philosophy of Environmental Education: Some Fundamental Goals, Concepts, Objectives and Developmental Issues*, Schmieder pointed out that "although some problems are widely apparent, some general goals clear, there is still little consensus as to what the domain of environmental education is, (or) what an environmental educator should know or do."[1] Schmieder's premise is supported by Childress, Harvey, and by a review of the literature pertaining to curriculum and program development in environmental education conducted by Roth (3, 4, 8). Subsequent to his review, Roth reported that "the presence of environmental education in public school curricula can often be characterized by loose organization and little sense of direction."

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Reprinted with permission of Heldref Publications via Copyright Clearance Center, Due for Publication in August 1994, Hungerford, Harold R., R. Ben Peyton, and Richard J. Wilke. "Goals for Curriculum Development in Environmental Education," *Journal of Environmental Education* 11:3, Spring 1980.

It is generally agreed by curriculum specialists that, irrespective of the subject, goals are needed to provide a sense of direction for curriculum development and instruction (9). Vande Visse and Stapp have expressed the need for goals in environmental education (13). They have warned that "... without a clear statement of goals, an environmental education program would become a series of unrelated experiences, focusing on limited program objectives." Unfortunately, this warning appears to have gone unheeded by numerous environmental education programs and projects, for Childress found in his survey of 301 environmental education programs and projects (3) that less than 40 percent of the programs and projects surveyed considered the following objectives to be primary objectives:

- Synthesizing various alternative solutions to environmental problems into a comprehensive plan.
- Analyzing the role of contributing factors (technology, legislation, etc.) to the causes of environmental problems.
- Evaluating how varying value systems modify and shape the environment.
- Developing proficiency in environmental data collecting techniques.

Childress concluded from his study that:

> *objectives focused on helping students become knowledgeable about their environment and its associated problems, and developing an appreciation of environmental resources, were considered of more importance in a majority of programs and projects than were those objectives focused on helping students actually solve environmental problems and develop problem solving skills.*

The lack of emphasis upon objectives which focused on helping students actually solve environmental problems and develop problem solving skills is contrary to the recommendations for environmental education objectives contained in both the 1975 Belgrade Charter and in the 1977 Tbilisi Intergovernmental Conference Report.

The apparent inconsistency between the objectives expressed for and used in EE programs and projects and those recommended by documents such as the Belgrade Charter and the Tbilisi Declaration may be due, in part, to the inherent difficulties confronting a curriculum developer charged with the task of translating what are actually general goals (e.g., to develop environmental awareness, knowledge, attitudes, skills, etc.) into manageable instructional objectives. The difficulties inherent in translating the general goals into instructional objectives have, as Childress has noted (3), resulted in the use of "hunches" as a basis for curriculum planning.

It is the opinion of the writers that curriculum developers and practitioners need a set of intermediate or subgoals which are more definitive than the general goals usually described for EE. This opinion is consistent with Krathwohl's proposal that a three-tier hierarchy be used for educational objectives (7). Krathwohl's proposed hierarchy consists of 1) general goals, 2) intermediate or subgoals, and 3) instructional objectives.

Additional support for the need for subgoals for EE came from the Teacher/Leadership Education Working Group during the 1978 National Conference on Environmental Education. Charged with the responsibility of aiding in the development of a national strategy for EE, this working group expressed the need for subgoals which could be used in curriculum planning. To meet this need the Group recommended that the original *Goals for Curriculum Development in Environmental Education* (Hungerford, Peyton and Wilke, 1978) be revised as needed, validated, and used to meet the need for subgoals for curriculum development.[2]

It is, therefore, the intent of this article to present 1) the *Goals for Curriculum Development in Environmental Education*, 2) the assumptions made in developing the goals, 3) the developers' validity comparison between the goals and the Tbilisi objectives for EE, and 4) the results of a subsequent validity assessment by a panel of five nationally recognized environmental educators.

Goals for Curriculum Development in Environmental Education[3]

The Superordinate Goal: ... to aid citizens in becoming environmentally knowledgeable and, above all, skilled and dedicated citizens who are willing to work, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment.[4]

Level I. Ecological Foundations Level

This level seeks to provide the receiver with sufficient ecological foundations knowledge to permit him/her to eventually make ecologically sound decisions with respect to environmental issues.

The Ecological Foundations Level would minimally include the following conceptual components:

A. Individuals and populations.
B. Interactions and interdependence.
C. Environmental influences and limiting factors.
D. Energy flow and materials cycling (biogeochemical cycling).
E. The community and ecosystem concepts.
F. Homeostasis.
G. Succession.
H. Man as an ecosystem component.
I. The ecological implications of man's activities and his communities.

Level II. Conceptual Awareness Level–Issues and Values

This level seeks to guide the development of a conceptual awareness of how individual and collective actions may influence the relationship between quality of life and the quality of the environment and, also, how these actions result in environmental issues which must be resolved through investigation, evaluation, values clarification, decision making, and finally, citizenship action.

Goals at this level are formulated to provide opportunities for receivers to conceptualize:

A. how man's cultural activities (e.g., religious, economic, political, social, etc.) influence the environment from an ecological perspective.
B. how individual behaviors impact on the environment from an ecological perspective.
C. a wide variety of environmental issues and the ecological and cultural implications of these issues.
D. the viable alternative solutions available for remediating discrete environmental issues and the ecological and cultural implications of these alternative solutions.
E. the need for environmental issue investigation and evaluation as a prerequisite to sound decision making.
F. the roles played by differing human values in environmental issues and the need for personal values clarification as an integral part of environmental decision making.
G. the need for responsible citizenship action (e.g., persuasion, consumerism, legal action, political action, ecomanagement) in the remediation of environmental issues.

Level III. Investigation and Evaluation Level

This level provides for the development of the knowledge and skills necessary to permit receivers to investigate environmental issues and evaluate alternative solutions for remediating these issues. Similarly, values are clarified with respect to these issues and alternative solutions. Goals at this level are presented in two components.

Component A: Goals for Component A are to develop in receivers:

A. the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and to synthesize the data gathered.
B. the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.
C. the ability to identify alternative solutions for discrete issues and the value perspectives associated with these solutions.
D. the ability to autonomously evaluate alternative solutions and associated value perspectives for discrete environmental issues with respect to their cultural and ecological implications.
E. the ability to identify and clarify their own value positions related to discrete environmental issues and their associated solutions.
F. the ability to evaluate, clarify, and change their own values positions in light of new information.

Component B: Goals for Component B are to provide receivers with opportunities to:

G. participate in environmental issue investigation and evaluation.
H. participate in the valuing process in a manner as to permit the receiver to evaluate the extent to which his/her values are consistent with the superordinate goal of achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment.

Level IV. Environmental Action Skills Level–Training and Application

This level seeks to guide the development of those skills necessary for receivers to take positive environmental action for the purpose of achieving and/or maintaining a dynamic equilibrium between quality of life and the quality of the environment. Goals at this level are presented in two components.

Component A: The goal for Component A is to develop in receivers:

A. those skills which will permit them to effectively work toward ends which are consistent with their values and take either individual or group action when appropriate, i.e., persuasion, consumerism, political action, legal action, or ecomanagement.

Component B: The goals for Component B are to provide receivers with opportunities to:

B. make decisions concerning environmental action strategies to be used with respect to particular environmental issues.
C. apply environmental action skills to specific issues, i.e., to take citizen action on one or more issues.
D. evaluate the actions taken with respect to their influence on achieving and/or maintaining a dynamic equilibrium between quality of life and the quality of the environment.

Assumptions Made By the Developers

The following assumptions have been made relative to the goals:

1. That the goals for curriculum development in EE are appropriate for use in guiding both formal and nonformal EE curriculum development efforts.

2. That a "receiver" can be thought of as any person, of any age, who can be reached through either the formal or nonformal educational sectors.

3. That the superordinate goal is philosophically correct as stated. That this goal represents the most appropriate direction for environmental education if EE is going to meet the tremendous challenges facing mankind both today and tomorrow.

4. That ecological foundations are critical to any EE program as prerequisite or corequisite cognitive knowledge. That ecological concepts are an integral part of EE. Despite this premise, it remains cogent to make certain that receivers distinguish between environmental education and ecology per se.

5. That, regardless of the importance of methodologies such as outdoor education, environmental interpretation, acclimatization, and outdoor recreation, these are not a part of the substantive structure of EE per se. Therefore, ancillary goals representing these activities directly do not appear here although a number of the goals for curriculum development in EE might be facilitated by the use of these and other methodologies.

6. That some level of "environmental sensitivity" is probably critical to the receiver's being willing and/or able to engage profitably in Levels II, III, and IV of this set of goals. Irrespective of this assumed prerequisite, the developers have arbitrarily omitted goals dealing with sensitivity on several grounds. These are:

A. Sensitivity would have to be represented as foundational.
B. Sensitivity per se cannot be operationalized in a manner as to provide for any measurable criterion level of affect.
C. Every individual will enter the EE process with a unique set of affective predispositions, generated by the individual's own background of experiences.
D. Like values clarification, sensitivity will, in part, result from EE activities themselves. In particular, judiciously developed instructional programs in ecological foundations and conceptual awareness should measurably assist in the sensitization process.

7. The process of valuing, values clarification, and moral reasoning are implicit in the goals, particularly Levels III and IV.

8. That environmental action is, in fact, represented by the five categories of action as stated in the goals (or in combinations of these categories). The assumption is also made that these action categories (or combinations of them) are exhaustive.

9. That the concept of maintaining and/or achieving a dynamic equilibrium (homerstatis) must be interpreted from both cultural and ecological perspectives. That said equilibrium may well result in a distinct compromise between quality of life on one hand and quality of the environment on the other. The curriculum developer must be constantly aware of this in order to produce curricular materials that look rationally at both the cultural and ecological costs involved in achieving a true equilibrium.

10. That the phrase ". . . to provide receivers with opportunities to apply environmental action skills to specific issues" implies no more than what is stated. That an educator cannot ethically force a receiver to take action but, instead, should provide mechanisms whereby action can be taken if desired.

11. That instructional objectives would be generated under each subordinate goal during curriculum development.

12. That EE is an interdisciplinary pursuit and that numerous disciplines must be reflected in the generation of any set of goals for curriculum development. Only in this manner can EE help receivers to successfully meet the challenges facing them as world citizens.

Developers' Initial Content Validity Assessment

Representatives at the 1977 Tbilisi Intergovernmental Conference on Environmental Education developed a set of objectives for EE ranging from an awareness level to a citizen participation level. These objectives follow:

AWARENESS: to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems.

KNOWLEDGE: to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associated problems.

ATTITUDES: to help social groups and individuals acquire a set of values and feelings of concern for the environment and motivation for actively participating in environmental improvement and protection.

SKILLS: to help social groups and individuals acquire skills for identifying and solving environmental problems.

PARTICIPATION: to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems.

In an effort to initially assess the content validity of the goals, the researchers decided to compare the goals expressed at each level to the five categories of environmental education objectives proposed at the Tbilisi Conference. To make this comparison, the researchers developed a two-axis comparison grid. Using this grid, the researchers independently analyzed each goal, identifying where an interface existed with the Tbilisi objective statements. Following this individual assessment, the researchers met together to synthesize the individual analyses. Table 1 represents the results of this assessment. It appears as though the goals for curriculum development bear a marked correspondence to the Tbilisi objectives. Therefore, the researchers infer a substantial degree of content validity for the goals as written.

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TABLE 1.–Developers' Validity Assessment–A Comparison of the Goals for Curriculum Development in Environmental Education to the Tbilisi Conference Categories of Objectives

Tbilisi Objectives					Developers' EE Curriculum Goals By Level	
Awareness	Knowledge	Attitudes	Skills	Participation		
1	2	3	4	5		
					Level I.	Ecological Foundations Level
X	X				________	All Subcomponents (A-I)
					Level II.	Conceptual Awareness Level
1	2	3	4	5		Subcomponent:
X	X				________	A
X	X				________	B
X	X				________	C
X	X				________	D
X	X	X			________	E
X	X	X			________	F
X	X	X			________	G
					Level III.	Investigation and Evaluation Level
1	2	3	4	5		Subcomponent:
X	X		X		________	A
X	X		X		________	B
X	X		X		________	C
X	X		X		________	D
X		X	X		________	E
X	X	X	X		________	F
X	X	X	X	X	________	G
X		X			________	H
					Level IV.	Action Skills Level
1	2	3	4	5		Subcomponent
			X		________	A
			X	X	________	B
				X	________	C
				X	________	D

Results of the Validity Panel Assessment

Subsequent to the developers initial content validity assessment, they submitted the goals to a validity panel consisting of seven nationally recognized environmental educators for their evaluation. The use of such a validity panel is an accepted and recommended means of establishing content validity (1, 6). Further, this same procedure is recommended by Saylor and Alexander (9) for defining and validating subgoals such as those included in the *Goals for Curriculum Development in Environmental Education*. A more complete description of the validity panel assessment follows.

During the winter of 1978 the authors developed an instrument to assess the validity of the goals. The developed instrument was sent with a copy of 1) the goals, 2) the assumptions, and 3) the developers' initial validity assessment to a panel consisting of seven prominent environmental educators. The instrument contained a number of categories to which the panelists were asked to respond. In an attempt to standardize the validity assessment, the developers requested the panelists to initially assume the superordinate goal to be conceptually correct as stated. The developers asked the panelists to make this initial assessment so that they would analyze the subordinate goals in the context of the superordinate goal. However, this did not mean that the panelists were also asked specifically to assess the superordinate goal. In additional directions given to the panelists, the developers asked them to assume that the four levels of goals were not necessarily exhaustive or appropriate as classified in the document. The developers also pointed out that it was entirely possible that they could have failed to recognize a critical element that should have "level status" in the model. The validity panelists were asked to respond specifically to the following items:

1. Content Validity–Subordinate Goals: *To what extent do you perceive that the subordinate goals in this model represent the substantive structure of the superordinate goal as stated?*
2. Content Validity–Superordinate Goal: *To what extent do you perceive that the superordinate goal is valid for use in curriculum development in environmental education?*
3. Syntax: (A) *To what extent is the sequencing from Level I through Level IV logical? That is, is the "level hierarchy" appropriate?* (B) *To what extent is there logical sequencing within each level?*
4. Subjective Analysis: *To what extent do you believe that this model represents a suitable framework for curriculum development in EE?*
5. Recommended Goals and/or Levels: *Are there other goals and/or levels perceived as critical?*

Completed validity assessments were received from five of the seven panelists. In general, the comments received from the panelists were consistent. This consistency of the comments greatly facilitated the process of revising both the goals and the assumptions made by the developers regarding the goals. The revision process was completed during the spring of 1978. The revised goals and the assumptions regarding the goals are presented in this article.

Conclusions and Recommendations

Subsequent to analyzing the results of the two validity assessments, the writers concluded that the revised *Goals for Curriculum Development in Environmental Education* constitute a valid, syntactically sound, suitable framework for use in guiding curriculum development in environmental education.

It is therefore recommended that the *Goals for Curriculum Development in Environmental Education* be used as a basis for guiding curriculum development in environmental education. Further, it is recommended that instructional objectives be generated under each subordinate goal during curriculum development. Finally, it is recommended that any efforts to achieve these goals for environmental education be undertaken in a manner that is consistent with the Guiding Principles for EE proposed at the Tbilisi Intergovernmental Conference on Environmental Education (12).

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2. L . Fleming, Recommendations pertaining to a national strategy for environmental education made by the Teacher/Leadership Education Working Group during the National Conference on Environmental Education, Washington, D.C., March 1978.

3. This document represents the final draft of the goals subsequent to validation. The final validity assessment was conducted by a panel of five professional environmental educators. This panel was composed of Drs. Robert S.Cook, John Disinger, Robert George, Harold McKenna, and R. Thomas Tanner.

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Knowing, Caring, and Practical Competence

Environmental Education and Ecological Literacy

By David W. Orr

From Holistic Education Review

EARTH-CENTERED learning rests on seven propositions:

1. **All education is environmental education.** By what is included or excluded, emphasized or ignored, students learn that they are part of or apart from the natural world. Conventional education, by and large, has been a celebration of all that is human to the exclusion of our dependence on nature. As a result, students frequently seem to be devoid of any sense of place or stewardship, or inkling of why these are important.

2. **Environmental issues are complex and cannot be understood through a single discipline or department.** Despite a decade or more of discussion and experimentation, interdisciplinary environmental education remains an unfulfilled promise. The failure occurred because it was tried within discipline-centered institutions. A more promising approach is to reshape the larger institutional structure to function as an interdisciplinary laboratory that includes components such as agriculture, solar technologies, forestry, land management, wildlife, waste cycling, architectural design, and economics. Part of the task of interdisciplinary education is the study of interactions across the boundaries of conventional knowledge and experience.

3. **The study of place is a fundamental organizing concept for education.** To a great extent, formal education prepares students to reside, not to inhabit. The difference is important. The resident is a temporary and rootless occupant who mostly needs to know where the banks and stores are in order to plug in. The inhabitant and a particular habitat cannot be separated without doing violence to both. The sum total of violence wrought by people who don't know who they are because they don't know where they are is the global environmental crisis. To reside is to live as a transient and as a stranger to one's place and inevitably to some part of self. The inhabitant and a place mutually shape each other.

Knowledge for the resident is theoretical and abstract. Its purpose is control. For the resident, education is akin to training, the overdevelop-

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ment of one part of self. For the inhabitant, education aims toward wholeness.

4. **For inhabitants, education occurs in part as a dialogue with a place and has the characteristics of good conversation.** Formal education happens mostly as a monologue of human interest, desires, and accomplishments that drowns out all other sounds. It is the logical outcome of the belief that we are alone in a dead world of inanimate matter, energy flows, and bio-geo-chemical cycles. But true conversation can occur only if we acknowledge the existence and interests of the other.

In good conversation, words represent reality faithfully. And words have power. They can enliven or deaden, elevate or degrade, but they are never neutral because they affect our perception and ultimately our behavior. The use of words such as *resources*, *manage*, *channelize*, *engineer*, and *produce* can determine whether we are engaged in conversation or monologue with nature. The language of nature includes the sounds of animals, whales, birds, insects, wind, and water: a language more ancient and basic than human speech. To hear this language requires patient, disciplined study of the natural world. But it is a language for which we have an affinity.

Good conversation is unhurried. It has its own rhythm and pace. Dialogue with nature cannot be rushed; it is governed by cycles of day and night, the seasons, the pace of procreation, and the larger rhythm of evolutionary and geological time. Human sense of time is increasingly frenetic, driven by clocks, computers, and revolutions in transportation and communication.

Good conversation has form, structure, and purpose. Conversation with nature has the purpose of establishing what is here, what nature will permit here, and what nature will help us do here. The form and structure of any conversation with the natural world is the discipline of ecology as a restorative process and healing art.

Such education should change how we live, not just how we talk.

5. **The way education occurs is as important as its content.** Students taught environmental awareness in a setting that does not alter their relationship to basic life support systems learn that it is sufficient to intellectualize, emote, or posture about such things without having to live differently. Environmental education ought to change the way people live, not just how they talk.

Learning in this view best occurs in response to real needs and the life situation of the learner. The radical distinctions typically drawn between teacher and student, between school and community, and between areas of knowledge are dissolved. Real learning is participatory, experiential, and interdisciplinary, not just didactic. The flow can be two ways—between teachers, who function best as facilitators, and students, who are expected to be active agents in defining what is learned and how.

6. **Experience in the natural world is both an essential part of understanding the environment and conducive to good thinking.** Experience trains the intellect to observe land carefully and to distinguish between health and its opposite. Direct experience is an antidote to indoor, abstract learning. It is also a wellspring of good thinking. Understanding nature demands a disciplined and observant intellect. But nature is also a source of language, metaphor, and symbol. Natural diversity may well be the source of much of human creativity and intelligence. If so, the simplification and homogenization of ecosystems can only result in the lowering of human intelligence.

7. **Education relevant to the challenge of building a sustainable society will enhance the learner's competence with natural systems.** Practical competence is an indispensable source of good thinking. Good thinking proceeds from the friction between reflective thought and real problems. Aside from its effects on thinking, practical competence will be essential if sustainability requires that people take an active part in rebuilding their homes, businesses, neighborhoods, communities, and towns. Shortening supply lines for food, energy, water, and materials, while recycling waste locally implies a competence not necessary in a society of residents dependent on central vendors and experts.

If these can be taken as the foundations of good education, what can be said of its larger purpose? In a phrase, it is ecological literacy, a quality of mind that seeks out connections. It is the opposite of the specialization and narrowness characteristic of most education.

The educated person has the knowledge necessary to comprehend interrelatedness and the attitude of care or stewardship. This implies a minimum level of practical competence in order to act on the basis of knowledge and feeling. Competence can be derived only from the experience of doing and the mastery of a "practice." Knowing, caring, and practical competence together can be regarded as the basis of ecological literacy.

In brief, ecological literacy is a quality of mind that seeks out connections.

Ecological literacy, further, implies a broad understanding of how people and societies relate to one another and to natural systems, and how they might do so sustainably. It presumes both an awareness of the interrelatedness of life and the knowledge of how the world works as a physical system.

Ecological literacy presumes that we understand our place in the story of evolution. It is to know that our health, well-being, and ultimately our survival depend on working with, not against, natural forces.

A second stage in ecological literacy is to know something of the speed of the crisis that is upon us. It is to know magnitudes, rates, and trends of population growth, species extinction, soil loss, deforestation, desertification, climate change, ozone depletion, resource exhaustion, air and water pollution, toxic and radioactive contamination, resource and energy use; that is, the vital signs of the planet and its ecosystems. To become ecologically literate is to understand the human enterprise for what it is: a sudden eruption in the enormity of evolutionary time.

Ecological literacy requires a comprehension of the dynamics of the modern world. It requires a thorough understanding of the ways in which people and whole societies have become destructive of the natural world. The ecologically literate person will appreciate something of how social structures, religion, science, politics, technology, patriarchy, culture, agriculture, and human cussedness combine as causes of our predicament.

The diagnosis of the causes of our plight is only half of the issue. But before we can address solutions, there are several issues that demand clarification. "Nature," for example, is variously portrayed as "red in tooth and claw," or like the film *Bambi*, full of sweet little critters. Economists see nature as natural resources to be used; backpackers see it as a wellspring of transcendent values. We are no more clear about our own nature, whether we are made in the image of God, or merely a machine or computer or animal. These are not trivial, academic issues. Unless we can make reasonable distinctions between what is natural and what is not, and why that difference is important, we are liable to be at the mercy of the engineers who want to remake all of nature, including our own.

Too often, we find nature portrayed as being full of sweet little critters.

Environmental literacy also requires a broad familiarity with the development of ecological consciousness. It is unclear whether the science of ecology will be "the last of the old sciences or the first of the new." As the former, ecology is the science of efficient resource management. As the first of the new sciences, ecology is the basis for a broader search for pattern and meaning. As such, it cannot avoid issues of values and ethical questions.

The study of environmental problems is an exercise in despair unless it is regarded as only the preface to the study, design, and implementation of solutions. The concept of sustainability implies a radical change in the institutions and patterns that we've come to accept as normal. It begins with ecology as the basis for the redesign of technology, cities, farms, and educational institutions, and for a change in metaphors from mechanical to organic, industrial to biological. As part of the change, we will need alternative measures of well-being.

Sustainability also implies a different approach that gives a greater priority to technologies that are smaller in scale and less environmentally destructive and that rely on the free services of natural systems. Not infrequently, technologies with these characteristics are also highly cost effective, especially when subsidies for competing technologies are leveled out.

If sustainability represents a minority tradition, it is nonetheless a long one, dating back at least to Thomas Jefferson. In contrast to the directions of modern society, this tradition emphasizes democratic participation, the extension of ethical obligations to the land community, careful ecological design, simplicity, widespread competence with natural systems, sense of place, holism, decentralization of whatever can best be decentralized, and human-scaled technologies and communities.

It is a tradition dedicated to the search for patterns, unity, and connections among people of all ages, races, nationalities, and generations, and between people and the natural world. This is a tradition grounded in the belief that life is sacred and not to be expended carelessly on the ephemeral. It is a tradition that challenges militarism, injustice, ecological destruction, and authoritarianism, while it supports all actions that lead to peace, fairness, sustainability, and the people's right to participate in decisions that affect their lives. Ultimately, it is a tradition built on a view of ourselves as finite and fallible creatures living in a world limited by natural laws.

From an ecological approach, "to know no boundaries" is the stuff of epitaphs.

The contrasting Promethean view, given force by the success of technology, holds that we should remove all limits, whether imposed by nature or morality. Its slogan is found emblazoned on the advertisements of the age: "You can have it all," or "To know no boundaries." The ecologically literate citizen will recognize these immediately for what they are: the stuff of epitaphs. Ecological literacy leads in other, more durable directions toward prudence, stewardship, and the celebration of the Creation. □

ECOLOGICAL balance—or just revenge? When a man asked a pet store clerk for five mice and 105 cockroaches and was told no cockroaches were available, he replied, "But it's important. My landlady is evicting me, and she said I must leave the room exactly as I found it."—In *The Boardmember.*

Part II: Operationalizing the Concept

Refining and Clarifying the Definition of Environmental Literacy in the 1990s

In the years since the term environmental literacy first emerged we have seen that there have been several formal interpretations of what it consists of, and there have also been a variety of other interpretations that have been perceived but not necessarily committed to publication. These varied interpretations have many areas of overlap which point to workable consensus and some differences that demand serious consideration. The term itself promises considerable usefulness in goal and objective setting for programs of many types if reasonable consensus on its meaning can be established.

To this end, the Environmental Literacy subcommittee of ASTM's TO4 Committee on Environmental Education has been developing such a consensus statement based on the formal literature and input from committee members and others in the environmental community using a modified Delphi process overseen by this writer. The completed document will be used to set forth guideline standards. Much of the material presented here detailing environmental literacy is derived from the results of this process as of spring 1991.

An Environmental Literacy Continuum

Society has a tendency to use the term literacy as if it were binary–either you are literate or you are not. In actuality, any type of literacy represents a continuum from zero ability to advanced skills.

It would appear that the presence or degree of any literacy can best be determined by observed behavior. Environmental literacy must likewise be defined in terms of observable behaviors. That is, people should be able to demonstrate in some observable form what they have learned — their knowledge of key concepts, skills acquired, disposition toward issues, and the like. In addition, any literacy may be seen to involve degrees of proficiency. These are actually points along a continuum ranging from inability to sophisticated competency. For example, the functionally literate reader is able to recognize the alphabet and can decode basic signs and key phrases or simple words, whereas a competently literate person shows extensive skill in reading, decoding, and comprehending a variety of complex writings. Similarly, environmental literacy presents a continuum of competencies of understandings, skills, and actions.

As with the achievement of reading literacy, there are stages of accomplishment along the way, i.e., ability to differentiate the characters of the alphabet, recognition that patterns of letters have meaning, etc. These have a rough correlation to what may be perceived as three levels of environmental literacy: nominal, functional, and operational.

At this point, we present a generalized statement of each of these levels. Later in the monograph more explicit detail will be provided.

Nominal environmental literacy indicates a person able to recognize many of the basic terms used in communicating about the environment and able to provide rough, if unsophisticated, working definitions of their meanings. Persons at the nominal level are developing an awareness and sensitivity towards the environment along with an attitude of respect for natural systems and concern for the nature and magnitude of human impacts on them. They also have a very rudimentary knowledge of how natural systems work and how human social systems interact with them.

Functional environmental literacy indicates a person with a broader knowledge and understanding of the nature of and interactions between human social systems and other natural systems. They are aware and concerned about the negative interactions between these systems in terms of at least one or more issues and have developed the skills to analyze, synthesize, and evaluate information about them using primary and secondary sources. They evaluate a selected problem/issue on the basis of sound evidence and personal values and ethics. They communicate their findings and feelings to others. On issues of particular concern to them, they evidence a personal investment and motivation to work toward remediation using their knowledge of basic strategies for initiating and implementing social or technological change.

Operational literacy indicates a person who has moved beyond functional literacy in both the breadth and depth of understandings and skills who routinely evaluates the impacts and consequences of actions; gathering and synthesizing pertinent information, choosing among alternatives, and advocating action positions and taking actions that work to sustain or enhance a healthy environment. Such people demonstrate a strong, ongoing sense of investment in and responsibility for preventing or remediating environmental degradation both personally and collectively, and are likely to be acting at several levels from local to global in so doing. The characteristic habits of mind of the environmentally literate are well ingrained. They are routinely engaged in dealing with the world at large.

Stages of Environmental Literacy

Although there is a high degree of individual variation in sequencing, people tend to progress through the development of degrees of environmental literacy in stages that include:

• Awareness	Perception of human/nature interactions and consequences in general or around a particular issue. This may be emotional, cognitive or both.
• Concern	Perception of real or potential negative consequences of a set of human/nature interactions and a feeling that some changes in those interactions need to occur.
• Understanding	Acquisition of detailed information about the present and future implications and consequences of current human/nature interactions and alternative interactions.

Acquisition of thinking and decision-making skills and their use in processing acquired information.

• Action	Application of understandings to individual and corporate behavioral changes that alter human/nature interactions in what is perceived as a responsible way that reduces or eliminates negative consequences.

It is important not to confuse capability at a particular developmental stage of literacy for achievement of the operational literacy itself:

> A person who is environmentally aware is not necessarily environmentally literate; nor is a person who possesses broad environmental understanding; nor is one who demonstrates great environmental concern; nor necessarily is one who takes action on environmental issues.

One demonstrates operational environmental literacy only when all the components come together in the actions taken. Environmental literacy is a synergistic response to integrated involvement of all the component pieces. However, people may be deemed functionally environmentally literate if their actions reflect all the components in only a few areas of human/environment interactions. Degree of environmental literacy is reflected in the breadth of human/environment interaction to which that person brings to bear all the skills and knowledges that define operational environmental literacy.

Achievement of operational environmental literacy in individuals is the ultimate purpose of environmental education. Indeed, one could define environmental education simply as education to develop environmental literacy and to foster development of environmental ethics. Hungerford, Peyton, and Wilke (1981) expand on this by implying in their definition of environmental education that environmental literacy involves becoming environmentally knowledgeable and skilled and dedicated to working toward, individually and collectively, achievement and/or maintenance of dynamic equilibrium between quality of life and quality of environment. With that in mind we should recognize that environmental education is more inclusive than such specialties as environmental science, environmental economics, environmental philosophy, or environmental law. It is quite possible to be well-versed in any one of these specialties, or even a combination of them, and still not be truly operationally environmentally literate.

Levels or Degrees of Environmental Literacy

Within the environmental literacy continuum it is useful to recognize 3 major levels of environmental literacy–nominal, functional, and operational–as briefly outlined earlier. In the sections below we describe the specific aspects of each level in general and in terms of the four major strands: knowledge, affect, skill, and behavioral. The items included in each strand have been factored out of many of the early definitions of environmental literacy and/or have been extracted from discussions of the ASTM TO4 Subcommittee on Environmental Literacy or correspondence through the modified Delphi Process being used by that group. It is truly a cooperative effort.

The Nominally Environmentally Literate

Nominal environmental literacy specifies a person able to recognize many of the basic terms used in communicating about the environment and able to provide a rough, if unsophisticated, working definition of their meaning.** Persons at the nominal level are developing an awareness of and sensitivity toward the environment along with an attitude of respect for natural systems and concern for the nature and magnitude of human impacts on them. They also have rudimentary knowledge of how natural systems work and how human social systems interact with them.

Knowledge Strand

Nominally environmentally literate individuals are familiar with:

- The nature of the basic components of elemental systems (e.g., living and non-living things, requirements for life).
- Types and examples of interactions between humans and nature.
- Basic components of societal systems.

Affect Strand

have affective sensitivities about:

- Appreciation of both nature and society.
- Elementary sensitivity and empathy for both nature and society.
- Elemental perceptions of points of conflict between nature and society

Skill Strand

have skills of:

- Identifying and defining problems.
- Recognizing issues surrounding identified problems or proposed solutions (e.g., latent and visible conflicts).

Behavior Strand

demonstrate:

- Familial, school, and youth organization activities and habits aimed at maintenance of environmental quality.
- Responding and coping behaviors.

** The Appendix contains of list of some basic terms nominally literate individuals might be expected to recognize with some degree of understanding. Further examples of basic concepts are to be found in Meadows (1989), Hanselman, et al (1989), or FICE-EE (1976).

The Functionally Environmentally Literate

Functional environmental literacy indicates a person with a broader knowledge and understanding of the nature and interactions between human social systems and other natural systems. They are aware and concerned about the negative interactions between these systems in terms of at least one or more issues and have developed the skills to analyze, synthesize, and evaluate information about them using primary and secondary sources. They evaluate a selected problem/issue on the basis of sound evidence and personal values and ethics. They communicate their findings and feelings to others. On issues of particular concern to them, they evidence a personal investment and motivation to work towards remediation using their knowledge of basic strategies for initiating and implementing social or technological change.

Knowledge Strand

The functional environmentally literate citizen, in addition to the knowledge of the nominally literate, has knowledge of and understanding of a number of ecological, economic, geographic, religious, educational and political processes and understanding of the effects/impacts of humans on natural systems, including:

- Population dynamics.
- Interactions.
- Interdependence.
- Limiting factors.
- Energy transfers, production, storage, and degradation.
- Biogeochemical cycling.
- Communities.
- Ecosystems.
- Succession.
- Homeostasis.
- Man as ecological variable.
- Uneven distribution of resources globally.
- Understanding dynamic relationships between science, technology, and society.
- Understanding of the process of scientific inquiry.
- Awareness of and concern about economic, social, political, and Ecological interdependence in urban and rural areas.
- Distinguishing between territory and map (a thing and its representation).
- Thinking in terms of systems.
- Thinking in terms of time frames or scales.
- Awareness of appropriate time/rate determiners for changes desired.
- Thinking critically and creatively.
- Consequences of individual actions.
- Human/personal impacts individually and collectively, in terms of an ecological perspective:
  population.
  political decisions.
  energy sources and uses.
  conservation.
  waste streams.
  recycling.
  transportation.
- Human cultural activities influence the environment from an ecological perspective.
- Basic numeracy and scale.

Skill Strand

The functionally environmentally literate demonstrate basic skills in analyzing problems and issues and conducting investigations of problems and issues using primary and secondary resources/strategies such as:

- Identifying environmental issues.
- Seeking historical background of issues.
- Investigating environmental issues.
- Evaluating sources of information.
- Analyzing environmental issues from various perspectives.
- Applying ecological concepts to predicting probable ecological consequences.

- Identifying alternative solutions and value perspectives.
- Evaluating alternative solutions.
- Conducting basic risk analysis.
- Identifying and clarifying his/her value positions.
- Examining issues from local, national, regional, and international points of view.
- Thinking in terms of systems.
- Demonstrating ability to forecast, to think ahead, plan.
- Thinking critically and creatively.
- Distinguishing between number, quantity, quality, and value.
- Working cooperatively with other people.
- Acting.
- Judging.
- Valuing.
- Articulating personal values.
- Decision-making.

Affect Strand

The functionally environmentally literate demonstrate such basic affects, attitudes and values as:

- identification with, and feelings of concern for, both society and the environment.
- willingness to recognize and choose among differing value perspectives associated with problems and issues.
- internal locus of control.
- treating public and private property with equal respect.
- sense of stewardship.

Behavior Strand

The functionally environmentally literate moves to action through selected lifestyle activities/ behaviors and community/organizational behaviors demonstrated by:

- Taking action positions and actions based on best available knowledge.
- Taking individual and/or group action through:
  - Persuasion.
  - Consumerism.
  - Political action.
  - Legal action.
  - Ecomanagement.

The Operationally Environmentally Literate

Operational literacy indicates a person who has moved beyond functional literacy in both the breadth and depth of understandings and skills and routinely evaluates the impacts and consequences of actions; gathering and synthesizing pertinent information, choosing among alternatives, and advocating action positions and taking actions that work to sustain or enhance a healthy environment. This person demonstrates a strong, ongoing sense of investment in and responsibility for preventing or remediating environmental degradation both personally and collectively, and is likely to be acting at several levels from local to global in so doing. For the operationally environmentally literate individual many, if not all, key elements of functional literacy have become habits of mind.

In addition to the knowledge, skills, attitudes and values, and actions of the functionally environmentally literate, the operationally literate demonstrate the following.

Skill Strand

Skills involved with evaluating problems and issues on the basis of available evidence (facts) and personal values and skills used in planning, implementing, and evaluating solutions, including:

- Using the process skills of scientific inquiry.
- Using ability to forecast, to think ahead, plan.
- Using ability to separate number, quantity, quality, and value.
- Imagining.
- Connecting.
- Valuing and value analysis.
- Using primary and secondary sources of information.
- Using ability to separate fact from opinion.
- Determining the roles played by differing human beliefs and values in environmental issues.

Affect Strand

Affects, attitudes and values that indicate a valuation of both nature and society, a sense of investment in and responsibility for the resolution of problems and issues along with a respect for both nature and society and a willingness to participate in, and show a sense of efficacy toward the resolution of problems and issues including:

- Awareness of and sensitivity to the total environment and its allied programs.
- Motivation to actively participate in environmental improvement and protection.
- Taking into account historical perspectives while focusing on current and potential environmental situations.
- Awareness of and sensitivity to the total environment and its allied programs.
- Strong internal locus of control.
- Personal responsibility:
    - recognition of impacts of personal behavior.
    - acceptance of personal responsibility for the impacts.
    - willingness to help correct or avoid negative impacts.
- Balancing love of nature with love of humanity.
- Willingness to curtail some individual short-term privileges for long range public good.
- Perceptual orientation movements from:
    - present to future.
    - society to humanity.
    - isolated phenomena to interacting systems.
- Personal environmental ethics.
- Respects diversity of human perceptions, learning styles and value systems.

Behavior Strand

Actions that demonstrate leadership in working toward the resolution of problems and issues including:

- Evaluating actions with respect to their impact on quality of life and environment.
- Providing verbal commitments.
- Working to maintain biological and social diversity.
- Continually examining and reexamining the values of the culture.
- Making decisions based on beneficence, justice, stewardship, prudence, cooperation, and compassion.

THE MONDAY GROUP

BY BILL HAMMOND
Director, Environmental Education
Lee County Schools
Fort Myers, Florida

The following is a testimony to "the possible." It shows us what young people can do, given the opportunity. Of profound importance in these times, Bill Hammond's leadership and clarity provide solid guidance for those of us who work with young people. Bill offers a structure that works for creating environments in which students truly can use their knowledge and skills in order to move "from awareness to action" in conscientious, thorough and responsible ways. Thanks to Bill, the young people of Ft. Myers, and their community for this opportunity to share in their learning—and to apply that learning, in our own ways, in our own lives and communities.
The Editors.

NOTE: This article is based on the activities of a group of senior high school students. Even so, the background may be of use to elementary school teachers. Structural changes would be necessary in most elementary schools; however, the spirit behind the accomplishments of the students is equally applicable to elementary as well as older-age young people. Grade school youth can move from "awareness to action." This article offers suggestions for some possibilities.

BACKGROUND

The concept that later established the High School Environmental Education Seminar was born in 1970. It was the height of the Earth Day consciousness. A group of high school students who had been in the Lee County Schools advanced track science program—some of whom had published in international scientific journals—were able to organize a system of ecology clubs in each of the middle and high schools in Lee County.

As one of the many projects that the students undertook in their ecology club system, an organized litter march down U.S. Highway 41 involved close to 2000 students. After careful planning and a day of collecting truckloads of litter from the highway and the adjacent canals—followed by a public speaking rally in one of the downtown bank parking lots in Fort Myers—the students found themselves surprised at the public support they received from the business community. Recognizing this support, the students wanted to continue their public campaign to effect environmental changes—the underlying purpose of their ecology clubs.

The students initiated a planning process. As they planned, their discussion focused on what their follow-up to this successful "litter campaign" would be. This led them to the idea of hanging two of the Lee County Commissioners, whom they thought to be environmentally insensitive, in effigy from the oak tree in front of the old Courthouse.

As their discussion progressed, twinges of concern passed through their advisor. I asked the students what they really knew about those County Commissioners. In the discussion, the "aha," or light bulb, phenomenon occurred. It became very clear that—despite their unusual sophistication and understanding of the scientific problems as well as the ecological relationships and applications in this community—the students actually had little knowledge and few skills for resolving conflicts or implementing change. They did not know how to use the democratic process. As a result, they repeatedly sought solutions based on emotion rather than a skillful application of facts, data and skills.

It was this situation that proved the impetus to initiate "The Monday Group"—the High School Environmental Education Seminar class program. The program goal: to help students acquire and refine skills through practical experience in addressing significant community problems. The program was to emphasize political and personal skills—from lobbying, to use of mass media, to empathizing with politicians and other community change agents, to acquiring insight into differing values and attitudes, to studying and describing varying points of view and the rationales underlying those views, to learning and practicing the skills of effective political advocacy within the democratic system.

ORGANIZING THE PROGRAM

The first step was to seek out current and potential high school leaders. Interested leaders in student councils and other school organizations were among those initially enlisted. In the process of freeing up student leaders to come to a full-day seminar class each week, some of the school building principals objected. They felt that the seminar program was pulling some of the most positive and influential leadership from the

Reprinted with permission of Bill Hammond, Due for Publication in August 1994, Hammond, Bill. "The Monday Group: From Awareness to Action,": *Project WILD.* Boulder: Western Regional Environmental Education Council, 1985.

schools. As a result, a compromise was struck. High schools were asked to send not only their most "positive" leaders, but also some of their most "negative." That is, students ranged from mainstream achievers to radical, anti-establishment critics. By this process, principals were willing to support the program proposal. Through persistence and negotiation, we were able to overcome initial structural problems in order to provide the opportunity for such a course of study.

SCHEDULING FORMAT

During the first year, the entire class met for one full school day every Monday of every school week. The problem we ran into the first year was basic: the students simply lost too much time from their regular school tasks. In addition, the responsibilities of the seminar were too much to add on a weekly basis to the already full responsibilities of the environmental education staff members, instructors for the seminar. We compromised and decided to meet one class day every other week. This is the format we have now used for the past 20 years. Through participation in this seminar throughout a school year, students are able to earn one full academic credit—usually in Science, and occasionally in Social Studies and Language Arts, depending on the nature of an individual student's project work in the seminar.

INDIVIDUAL STUDENT PROJECTS

Each student in the course is required to do an individual study project of some significance during the year. The project should in some way relate to their expression and interest in the environment. Over the years, these projects have ranged widely—from anthologies of poetry, to original albums of songs on endangered species and energy topics, to water quality surveys of canal systems, to surveys of manatees in a river. Most of the projects have made significant contributions to the body of knowledge and environmental literacy in this community.

CLASS PROJECT

The entire class must select by consensus a community issue or problem that involves elected leaders at some level. The group generally makes a selection by late fall. As a group, the students must design a plan for either resolving or contributing to the resolution of the community problem or issue they have identified, and in which they have become interested, by the end of the school year. The rationale behind this requirement: Many of these students are proficient in working at individual study projects and very specific smaller scale activity projects within their school environment. However, most of these students have not worked on a community action project of major significance. The class projects for the seminar require interacting with elected officials, using organization and stamina to work within committee structures, and working through the frustration and difficulties of the human problems encountered in accomplishing large group kinds of activities. The purpose of this class requirement then is to force students into a situation where they must learn to organize themselves: to deal with the issues of those who carry through with their work and those who fail to carry through; to address questions of emerging leadership; and to discern questions of responsibility as well as rights. These become primary issues that must be addressed by each individual as the class works to resolve the inevitable string of dilemmas that emerge in the process of completing the annual project.

ADDITIONAL ASSIGNMENTS

A third student requirement usually involves a series of smaller assignments in the class period. These smaller assignments have ranged from writing television scripts for the local affiliate of a major network to air on the Sunday evening news broadcast, to reviewing local zoning cases and taking a position on whichever sides of the issue with which they felt their values most aligned.

CRITERIA FOR GRADING

Students' grades in this class are based on three criteria:

1. **Their participation in class,** since their one class participation every other Monday is the equivalent of two weeks of regular school in any given subject that they have, as well as additional time spent on class project work beyond meeting hours;
2. **The amount of input and quality of work** that they perform in their individual study project, which is determined in conference between the course instructor and the students; and
3. **The level of input and responsibility** they assume in working with the large group project, with that level of performance reviewed between the individual student and the instructor.

Grades are determined through mutual consensus and discussion between the instructor and each student, in line with the abilities of the student and the responsibilities to which the student has made a commitment within the ground rules of the class.

GETTING UNDERWAY

Early in the first semester of the course—particularly during September, October and early November—the primary objective is to expose the class members to as many of the local environmental resources and issues as possible. So, students have waded swamps and through mangroves; they've walked beaches and they've been through the Sewage Treatment Plant, the Power Plant and the Mosquito Control facilities. They are literally immersed in looking at and thinking about the southwest Florida community in which they have a real stake.

Remember that this class is comprised of "negative" and "positive" leaders. Over the years, we've learned that it is very difficult to maintain the so-called disinterested learners who are there in the class because they generally have taken up negative leadership roles in their school. These students have tended to dropout of this voluntary program by the second month. We searched for ways to minimize this dropout phenomenon, and struck upon a way that has been successful over the past 20 years in bringing the group together as a community.

We have established a procedure that is initiated within the first month of the class operation. The strategy is to take students on a residential camping trip. In our case, more often than not, we go to the Ocala National Forest. Here, students get to work together as a community with a primary emphasis on each student's personal development. Each student's sense of personal responsibility is nurtured as each is respected as a whole and valuable human being. Activities include some values clarification kinds of experiences, canoeing, camping, New Games, interactive kinds of skill-building and listening to some people who are personally involved as leaders in the state of Florida in environmental issues and problems. We've found that this experience helps to meld the group together into a community. It allows students time to sort one another—not on the basis of their academic skills and achievement, but on the basis of their skills as human beings. Consequently, when they return from this trip, they are usually prepared to identify and agree upon a significant community problem that will serve as the focus of the group's efforts during the school year. And, the initial purpose of this outing has been served—successfully minimizing student drop-out from the program.

UNDERLYING COURSE OPERATING RULES

The fundamental basis for the class is a set of operating rules. These operating rules have been established over the years and have become the byline for the class operation. The rules are basic and they apply to instructors as well as students.

The course is premised on helping students understand **natural models**: the principles of **diversity, change, interdependence** and the **interrelationships** of all things on the planet, including the ways matter cycles and energy flows, making those cycles possible over and over again. As students understand these basic and fundamental concepts concerning how the universe works, a set of operating rules for their personal working is overlain.

Instructors are facilitators. They must continually make absolutely sure that **students have equal time access to all viewpoints and positions on all issues they encounter in class**. Balance in viewpoint is a key, rather than any form of advocacy that manipulates students.

An overlying premise of this entire course of study is that it must be experiential. The students **must do, rather than simply be told**.

The basic components for this set of rules: **truth, honesty, consistency**. These are key factors in building long-term trust and credibility in the class group as well as the community. So, for example, if you don't know, say so! It is very important to be consistent with all people encountered, and to be consistent with basic values when formulating positions on issues.
Here are the operating rules, addressed to the students who participate in the class.

Positive Viewpoints The first of these rules is that we will only accept positive viewpoints in this class. If you are against something, if you don't like something, or if you don't want something to happen, then you must turn it around. You must be **for something**, you must **want something to happen**, you must have a wish. In the class, we make it the norm to establish and express that positive wish—what it is you want to see happen. (Students are always in a posture of being for something that they care deeply about, rather than against something.)

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Homework The second of the rules: You have to do your homework. You must research the background information. You must know the topic as well as anyone in the community. You must become an expert on the data and knowledge base relative to the topic for which you are interested in becoming an advocate. Doing your homework means applying the range of academic skills to find out what the issues are, the background information, and the technical data that are available in order to find out as much about that topic as you can. You become your own expert.

Persistence The third rule is: Persistence. For years, that word was displayed as a three-foot-high motto statement over the door in the classroom. In environmental matters, there rarely is closure. They tend never to be resolved; they simply go through varying stages of semi-closure. Therefore, one must be persistent if he or she is going to succeed in the long haul. Persistence is a critical behavioral factor in anyone interested in effecting change in a democratic society.

Force Field A fourth consideration is what we have for years called the force field. The force must be with you if you're going to succeed in a democratic society. The force field phenomenon requires you to analyze those groups and individuals who support your position, and to seek out and find those who might not agree with your position. In force field, we try to take that positive energy from those who agree with us and support our views, and try to at least neutralize those who do not agree with us so that their energy is not counter to ours as we try to implement solutions. In other cases, force field knowledge enables one to be centered to opposing energy and thereby gracefully to let it pass on its own path.

In working with the force field, **extreme or radical views are not viable**. Those in decision-making roles cannot be threatened by being faced with making very rapid, widespread or radical departures from the norm. A series of small steps is what is necessary in order to effect change in this culture. The combined impact of these small steps leads to the desired major change in behavior.

Individual The fifth basic rule: Everyone needs to be treated as an individual. Everyone is a human being of supreme moral worth, and while you may not agree with him or her, or you may not personally like to spend time with that person, that person is a human being and deserves every bit of the respect with which you would wish to be honored. Each person is thus to be treated as an individual, both in the class, and in the community.

No Stereotyping A sixth rule: No stereotyping allowed. Even when we treat people as individuals, it is still too easy to think of them as part of a stereotypic group. He or she is a "developer" or an "environmentalist" or a "politician." Stereotypes get in people's ways, very often preventing folks from seeing one another as individuals, and thereby preventing any real understanding—mutual understanding—as individuals. So, a critical rule in this seminar: stereotypes are not acceptable at any time and certainly not when attempting to work with the community.

Recycle A seventh rule: If you've done your homework and followed all those previous rules, and you fail to accomplish what it is you set out to accomplish, then you must recycle. You failed because something didn't happen that needed to happen. So, you must recycle yourself through the process again and find out what it was that you did not succeed in doing effectively enough the first time.

No Scapegoating This is the final rule: No scapegoating. If, in fact, you need to recycle, and you didn't succeed the first time, scapegoating is not an acceptable way of transferring the responsibility for your lack of success to some external source. It is easy to transfer your lack of success to bureaucrats who are unresponsive or to other stereotypic groups. In fact, however, what generally has happened is that, somewhere along the line, you missed a step as a class group. You missed resolving a need of some group or individual who was in a decision-making role. Missing that step ultimately prevented you from succeeding in implementing your solution. So it's very important that you analyze. Go back and find where that spot was. Was there a glitch in your media campaign? Was there a gap in communicating with some of the agencies or organizations or individuals? Did you neglect to get proper approval or sponsorship from key individuals or groups?

This package of premises and rules is the foundation for the operation of this class. It provides the students with an operating framework for acquiring and developing real skills based on real problems of concern to them in their own community. They are in the position to be always for something and not against something. It gives them the responsibility for their own success. It gives them the tools so that success is virtually assured, if they are, in fact, realistic—and have done their "homework."

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EXAMPLES OF MAJOR CLASS PROJECTS

The Environmental Seminar classes have successfully accomplished a number of projects over the years. The following are examples.

Purchase and Protection of a Six Mile Cypress Swamp

An early project undertaken by students resulted in the acquisition of the Six Mile Cypress—a 2,500 acre cypress strand that flows through the eastern boundary of the City of Fort Myers, becoming the urban shaper as Fort Myers grows into Lee County. The swamp had been proposed for public acquisition under federal acquisition lists. It also had been designated as a potential state park area, but after years of sitting on lists, it had moved no closer to purchase. Students who had waded through the swamp as part of the Seminar class experience felt that it was too unique to see chopped up into short-term-use farm fields and real estate development. They were concerned about overdrainage conditions and general degradation due to lack of any kind of coordinated planning or protection for the swamp.

After considerable research, the students determined that the state and federal government would not be able to buy the swamp. They conducted a biological survey, an ownership survey, a geological survey, a hydrological survey and a land-use survey. All their information was compiled into a booklet on Six Mile Cypress Swamp. This was the project for one year's class group: the compilation of an extended knowledge base about Six Mile Cypress Swamp.

Since juniors and seniors are selected to participate in this course, many of the same students who had worked on compiling the booklet continued from their junior year into their senior year. Their leadership in the next year's class group was instrumental. The students decided that the Six Mile issue was very important to them, and their major project for that year would be to try to get a public referendum on the ballot to allow citizens to acquire Six Mile through a local tax referendum. The students prepared their ballot presentation. They did their homework. They lobbied with each individual County Commissioner using teams, and proceeded to work throughout the year in trying to get the Six Mile Cypress issue placed on a referendum ballot. After having lobbied individually with the five County Commissioners, the students found they had the support of four. With what they thought were four votes in place, the students presented their plan to the County Commission at an open public meeting. Much to the students' surprise, the County Commissioners turned them down three to two on the issue of placing the referendum on the ballot for the voters. Following the rules of the class, the students came back, recycled, mumbled a bit and immediately started to work to figure out how to overcome that negative vote. They were successful. The students worked to meet all the tenets the County Commissioners had placed in objection. Within one week, a new vote of the County Commissioners on this issue was held, and the five Commissioners unanimously supported placing the referendum on the ballot for the public to vote in the following November. The students were also able to influence the wording of the ballot for the referendum. They were the ones to select at what public ballot, in the interest of timing, the issue would be placed before the voters. They were intimately involved in the critical political decisions affecting this referendum issue.

The following year's group—the third year of the Six Mile Project—had the problem of coming in as a new group with some members who had carried over from the previous year's junior population. The third-year-group decided to stick with the project, and found themselves having to sell this project to the voters in a community where one-third of the population are retirees on fixed incomes. Between September 15th and November 5th, students had to carry on a campaign that literally had no budget attached to it. They needed to sell a referendum for an increase of one-half mill of taxation for two years. Lee County voters were being asked to tax themselves to buy the Six Mile Cypress Swamp.

The election was held in November. The voters overwhelmingly approved the referendum in the highest plurality ever given to a tax issue in Lee County. The process of purchasing the swamp has been underway since that time, proceeding smoothly through the tax monies generated in that referendum.

The next year's Seminar class took a look at the Six Mile Cypress project and decided all the work was not done—even though the swamp was now to be purchased and protected. The students were heartened by the public's approval of the acquisition of Six Mile Cypress but they discovered that the Lee County Parks and Recreation Department had no staff with professional training in park planning. Not one of Lee County's regional parks had a master plan established for it. So, in this fourth year of the Six Mile Project, the class group made it their project to establish a Park Master Plan for the Six Mile Cypress Swamp and became the technical assistance arm for the Lee County Parks and Recreation master plan group. They also assisted in establishing guidelines for the county's acquisition of Six Mile Cypress, negotiating a contract with The Nature Conservancy to assist in that acquisition.

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Manatee Survey

Another major project that students worked on in ensuing years was a survey of the manatee population in the Orange River. That survey led to the group interacting during a controversy between the Environmental Protection Agency (EPA) and the Florida Power and Light Company. The EPA had discovered that Florida Power and Light, at its local generating plant—in drawing water from the Caloosahatchee River and discharging into the Orange River—had created a delta-t block in the Orange River. A temperature gradient barrier was created that prevented the manatees from migrating up into the headwaters of the Orange River to reach their nursery and spawning grounds. The EPA had provided an injunction to Florida Power and Light to redesign their canal discharge system and redirect it into the Caloosahatchee River.

Such a project would have cost millions of dollars and consequently placed a great burden on local rate payers. Florida Power and Light requested that the Seminar class review the situation with the hope that they would support Florida Power and Light's position.

Remember that one of the guiding principles of the Seminar is that in all endeavors students are always exposed to both sides of any issue, or as many sides of an issue as are plausible. Consequently, students were given an opportunity to interact with the officials and biologists from Florida Power and Light, and they were then also given the opportunity to interact with the officials of the EPA in Atlanta who had placed this injunction on Florida Power and Light. The students concluded that the EPA rules were excellent and well-founded. The students also decided, after having done much homework, that there were extenuating circumstances in the Orange River that perhaps overshadowed the intent of the EPA injunction. That is, they discovered that the key index species of manatee that the EPA was concerned about were not longer able to reproduce significantly or carry on nursery functions in the Orange River because previous development in the headwaters of the Orange River had already altered that system. Secondly, they discovered that the manatee population in the Orange River was far greater than anyone had anticipated or counted previously. Consequently, their logic was that if the canal system were shifted from the Orange River into the Caloosahatchee River, those manatees—an endangered species—would be placed in further jeopardy of their ultimate survival. The students' legal research indicated this to be contrary to both the Marine Mammals Protection Act and the Endangered Species Act, and thereby created an illegal situation. The EPA could not, as a federal agency, create a new condition that would further threaten an endangered species. In concert with Florida Power and Light, the students requested a public administrative hearing. EPA granted that hearing, and the students testified on behalf of Florida Power and Light, also strongly expressing the view that the EPA policies and regulations which guided the injunction in the first place were excellent. The students emphasized that this case in Lee County should in no way weaken those regulations. They emphasized the unusual nature of the extenuating circumstances of upland development in the river system and, more specifically, of the unique manatee population that had come to winter in the Orange River complex due to the power-heated effluent.

This was thus a classic case of a group of high school students reviewing all sides of an issue, resulting in their being able to contribute to the resolution of a community problem of economic, political and ecological significance. As a result of their also recognizing the lack of protection for manatees in the Orange River, the students proceeded to work with the county commissioners to post signs in the Orange River. The students raised funds. They had signs warning people with boat traffic at every marina, cautioning about manatee in order to protect them. In addition to signs on the Orange River, they had signs at every marina on the Caloosahatchee River and the adjacent tributary streams where manatees are known to spend time. The students got Lee County to post the park that is adjacent to Florida Power and Light effluent canal, heavily used by winter fishermen, warning people of the manatees in that canal system and of the penalties for harassing or harming the manatees in any way. This action was the forerunner of Florida's state manatee laws—supported by another Seminar student group two years later as the laws were being created by the Florida state legislature.

Park Management

Another class group of students worked trying to resolve a conflict between Lee County and the state of Florida over management questions on a 640-acre county park called Cayo Costa Park. Students were able to move both parties to a position where an agreement was established for management responsibility in the ultimate future of that park system.

Southern Bald Eagles

Seminar groups over several years focused on the southern bald eagle population in Lee County. The project began when students discovered that Lee County has one of the largest wintering southern bald eagle populations in the United States. The southern bald eagle is an endangered species. The students found that the future prognosis for this animal in Lee County is growing dimmer. The preponderance of eagle's nests in the county exists on land that is suitable for development. One by one, those eagle's nests are gradually being crowded out as development moves into the coastal plain and the coastal zone, along the feeding and nesting zones for the southern bald eagle. Students researched federal and state policies and regulations that protect the bald eagle. They researched the Lee County Comprehensive Plan and discovered that the policy statements whereby Lee County Commissioners take a strong stand toward protecting eagles actually provide no specific mechanisms for doing so. So, students have worked with scientists, public officials, developers and others to establish a set of proposed new regulations to guide the protection of the bald eagle as development takes place in and around Lee County. These development regulations have been proposed for adcption as a part of Lee County's Comprehensive Plan. After years of work, they were adopted.

SUPPORTING THE POSSIBLE

Lee County's Environmental Education Seminar Program takes interested students from five public high schools and one private high school and mixes them together into a group of students with high potential for leadership. These are students who are likely to be change agents in their communities in the future. This program gives them an opportunity to practice their leadership through experience with real-life situations. They gain skills for political effectiveness in order to become more effective leaders. They are supported and prepared for becoming leaders who understand their community, understand many community relationships, and know how to effect change which they believe is desirable and needed for a healthier, happier, wiser, more loving, more ecologically sound community. They are whole human beings who know how to accomplish such change—all within the operations of a democratic society.

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Integrating Environmental Education Into the Classroom

2

A FREQUENT CONCERN REGARDING EE is where and how to fit it into an already crowded curriculum. While EE can be very successful as an independent class, it can also be incorporated into all subjects, across all grade levels. The articles in this section help educators articulate a rationale for a more interdisciplinary approach to EE, and offer examples of teachers that have successfully built curricular objectives on environmental topics.

Ramsey, John M., Harold R. Hungerford, and Trudi L. Volk. "Environmental Education in the K–12 Curriculum: Finding a Niche," *Journal of Environmental Education* 23:2, Winter 1992, pp. 35–45.

In this article, the authors review approaches for incorporating EE into the classroom. They remind us that the goals of EE involve a comprehensive process or framework, and without reference to this, programs often become fragmented and ineffective. The authors discuss two instructional models: one where an EE course would be inserted into the curriculum, and another where EE would be integrated or infused into existing subjects throughout the curriculum. To help with the "infusion" approach, the authors provide lists of subject areas into which EE topics can be integrated. They also cite the Wisconsin EE curriculum model as a comprehensive plan to incorporate EE throughout the curriculum.

Simmons, Deborah A. "More Infusion Confusion: A Look at Environmental Education Curriculum Materials," *Journal of Environmental Education* 20:4, Summer 1989, pp. 15–18.

The commitment to integrate EE throughout the school curriculum is well supported among environmental educators. However, in reality, it is science and social studies teachers that adopt EE. Simmons suggests that this may be explained by the lack of curricular materials designed for subjects such as reading or health. Designing more activities and materials for these type of subject areas may help expand the integration of EE throughout the school curriculum.

Iozzi, Louis A. "What Research Says to the Educator, Part Two: Environmental Education and the Affective Domain," *Journal of Environmental Education* 20:4, Summer 1989, pp. 6–13.

According to Iozzi, few in EE have focused on the affective domain. Improving environmental quality requires that we examine "existing societal attitudes, values and lifestyles." Thus, Iozzi says, students must learn in the affective domain, which includes values, ethics, and emotion. They must take information and decide what "should" be done, a task that requires practice and sensitivity.

Williams, Jackie and Terry Deal Reynolds. "Courting Controversy: How to Build Interdisciplinary Units," *Educational Leadership* 50:7, April 1993, pp. 13–15.

This inspiring article shows that EE can be successfully integrated into several subject areas. The authors worked with two other sixth grade teachers to integrate EE into four subject areas as they guided their students in researching environmental issues in another community. They offer helpful advice on planning and forming interdisciplinary teams, choosing a theme or case study, and avoiding common pitfalls. Ultimately, they identify positive student response as a powerful motivator for this approach.

Burke, Jim. "Tackling Society's Problems in English Class," *Educational Leadership* 50:7, April 1993, pp. 16–18.

Here is an example of how EE can be incorporated into a single subject area. Burke integrates a multifaceted project of researching social problems into his English class, a project coinciding with the study of the required literature. Burke's workshop format echoes that of Hungerford's "issue investigation process" format. In addition, Burke describes a transformation in his students' learning: "Feelings of civic involvement, of the ability to make a difference, abound."

Orr, David W. *Ecological Literacy: Education and the Transition to a Postmodern World*, Albany, NY: State University of NY Press, 1992, Chapter 7, "A Prerequisite to the Great Books of Allan Bloom: A Syllabus for Ecological Literacy."

Orr presents his alternative to Bloom's "great books": an eclectic reading list that promotes ecological literacy. The syllabus includes works on the laws of thermodynamics, the basic principles of ecology, carrying capacity, limits of technology, sustainable agriculture and forestry, steady-state economics, and environmental philosophy and ethics.

Orr, David W. *Ecological Literacy: Education and the Transition to a Postmodern World*, Albany, NY: State University of NY Press, 1992, Chapter 5, "Ecological Literacy."

According to Orr, "thorough knowledge...will not save us in the absence of feelings of kinship." Broad understanding, insightful observations, aesthetic appreciation, and a sense of wonder are all important components of ecological literacy. In addition, practical competence is needed. For these and other reasons, Orr argues for a new concept of education. He presents six principles of education, including "all education is EE," and "the way education occurs is as important as its content." Orr concludes with an argument for establishing a goal of ecological literacy (the syllabus for which is included in the following reading) for all students.

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Environmental Education in the K–12 Curriculum: Finding A Niche

JOHN M. RAMSEY, HAROLD R. HUNGERFORD, and TRUDI L. VOLK

ABSTRACT: Significant progress has been made in the United States in including the environment in government, business, household, and individual decisionmaking. Unfortunately, there is no parallel trend in the nation's K-12 schools. This article reviews the basic precepts of environmental education, summarizes state-level efforts directed at its establishment, and makes suggestions for systematically incorporating it into the K-12 curriculum.

World citizens came together for Earth Day 1990, a 20-year anniversary of the first Earth Day. Like its predecessor, Earth Day 1990 spawned universal testimony and reaffirmation of the level of concern and significance of the human role in the natural world. It symbolized the problematic interactions between the quality of life and the quality of the environment for the planet's inhabitants. And once more, the world looked to its educational system for answers.

The defense and improvement of the environment on behalf of present and future generations of all living things has become an imperative educational goal. The message of Earth Day is that each individual must recognize and accept this goal and become an active participant in working toward its achievement. Because education is the vehicle through which society prepares its citizens to carry out their responsibilities, education must be environmental. This task identifies another major challenge for all educational systems and their decision makers.

The task of recasting U.S. K–12 curricula in an environmental dimension poses not only significant challenges but also untapped potential, particularly with respect to opportunities for interdisciplinary configurations. The curricular and instructional tools necessary for effective, systematic K–12 education about the environment (EE) are available. These EE strategies spring from widely accepted parameters of educational, cognitive, and social learning theories. The real task is not who, what, or how. It is when and where—the committed integration of effective and systematic EE approaches into existing K–12 curricular frameworks. For a variety of administrative, curricular, and instructional reasons, this task will not be an easy one.

Because of its multifacted nature, environmental education means different things to different educators. The phrase "environmental education" might trigger concepts of ecology, environmental science, outdoor education, or issue instruction—each of which might fit under the EE umbrella and each of which offers only a partial contribution to the total package. Hence, both conceptual ambiguities and communication risks exist with the use of the phrase "environmental education." The task at hand is to present a conceptual framework

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and the curricular models that will provide both integrity and utility in the quest for developing K-12 EE curricula.

A Curricular Framework for EE

Environmental education must prepare individuals to be responsive to a rapidly changing technological world, to understand contemporary world problems, and to provide the skills needed to play an effective role in the improvement and maintenance of the environment. Therefore, EE must incorporate many aspects of the environment: natural and manmade, technological, social, economic, political, cultural, and aesthetic. Further, EE must emphasize and bridge from the personal, local, and national to the global in linking the actions of today with the consequences of tomorrow.

Given the description above, the following superordinate goal statement sets forth the desired end result of a K-12 EE program:

> The goal of environmental education is to help students become environmentally knowledgeable, skilled, and dedicated citizens who are willing to work, individually and collectively, toward achieving and maintaining a dynamic equilibrium between the quality of life and the quality of the environment. (Hungerford and Peyton 1976, p. 2)

This EE goal statement implies a continuum of objective clusters that serve as guides for curriculum and instruction development. These objectives, originally established in the Tbilisi Declaration (Conference declaration 1977), are as follows:

Awareness: Helping students acquire an awareness and sensitivity to the total environment and its problems; develop the ability to perceive and discriminate among stimuli; process, refine, and extend these perceptions; and use this new ability in a variety of contexts.

Knowledge: Helping students acquire a basic understanding of how the environment functions, how people interact with the environment, and how issues and problems dealing with the environment arise and how they can be resolved.

Attitudes: Helping students acquire a set of values and feeling of concern for the environment and the motivation and commitment to participate in environmental maintenance and improvement.

Skills: Helping students acquire the skills needed to identify, investigate, and contribute to the resolution of environmental problems and issues.

Participation: Helping students acquire experience in using their acquired knowledge and skills in taking thoughtful, positive action toward the resolution of environmental problems and issues.

Making curriculum-related decisions is always difficult. These tasks can be facilitated if planners have a cohesive and valid set of goals. Using the Tbilisi objectives presented above as a model, Hungerford, Peyton, and Wilke (1980) developed a set of curriculum development goals for environmental education. Those goals encompass the following four levels of cognitive knowledge and skills within a broad scope of environmental literacy: (a) ecological foundations; (b) issue awareness; (c) investigation and evaluation; and (d) issue resolution. The first two goal levels, foundations and awareness, focus on conceptual awareness of ecological principles and environmental issues. The latter levels include goals that deal with the development and application of skills prerequisite to investigating and evaluating issues and to participating in the remediation of these issues. Interested readers should see Hungerford, Peyton, and Wilke (1980) for a complete listing of the four goal levels and attendant 20 goal statements.

EE Program Characteristics

The goals and objectives of environmental education imply a number of discrete programmatic characteristics. Engelson (1986) claims that EE programs can be described as follows:

Action-oriented: Involving students in the resolution of real environmental problems and issues.

Continuous: Part of all subject areas at all grade levels but not precluding specific curricula and instruction focused solely at EE.

Experiential: Using a diverse array of learning approaches and environment.

Future-oriented: Concerned about future as well as present generations.

Globally oriented: Considering the Earth as a single ecosystem.

Holistic: Dealing with the natural, manmade, technological, social, economic, political, cultural, moral, and aesthetic aspects of the environment.

Interdisciplinary: Drawing content from all disciplines.

Issue-oriented: Dealing with issues having local, regional, national, and international perspectives.

Neutral: Approaching issues and problems without bias, where the classroom is a forum where all points of view should be heard.

What Is the Status of EE in Schools?

"Environmental education" has been a curricular buzzword since the 1960s. How has this momentum been translated into K-12 curricular programs? The last national curricular study of environmental education (Childress 1978) suggests that most of that energy has been dissipated in discussion. Environmental education, if it exists at all, is loosely organized and has little sense of direction. The Childress study of 301 environmental

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education programs found that less than 40% of those surveyed considered the following to be "primary" objectives:

- Synthesizing various alternative solutions to environmental problems into a comprehensive plan
- Analyzing the role of contributing factors (technology, legislation, etc.) to the causes of environmental problems
- Evaluating how varying value systems modify and shape the environment
- Developing proficiency in environmental data collection

Childress concluded that most EE programs placed more emphasis on knowledge of the environment and an appreciation of its resources rather than on helping students develop the knowledge and skills to solve environmental problems. It seems that most programs do not embrace or focus on a clearly delineated goal framework. Without reference to a cohesive frame of reference such as the goals and objectives described above, education about the environment is a curricular glut—multifaceted, unorganized, fragmented, and probably ineffective.

The discussion above concerns only the school curricula that have attempted to do something in the name of environmental education. EE has not found an established niche in the U.S. schooling process. Most school-based educators have not adopted a frame of reference for either EE curriculum or instruction, although they are widely used in nonformal contexts (e.g., in zoos, museums, and parks). EE in U.S. schools is not theoretical, systematic, or comprehensive.

State-Level EE Initiatives

Despite EE's lack of status in U.S. schools, several states have begun to exercise "top-down" leadership in establishing EE in the school curriculum. During the 1980s, lawmakers in Arizona, Florida, Iowa, Pennsylvania, and Wisconsin enacted a variety of legislation that, in part, promoted EE within local school districts' curricula. Wisconsin's efforts, for example, represent a serious attempt to deal with the problem of EE in schools.

Wisconsin's initiatives, as a component of a larger statewide educational reform package, included (a) a preservice environmental educational requirement for about two-thirds of all teachers (i.e., early childhood, elementary, agriculture, science, and social studies) applying for state certification; (b) the development of an environmental educational curriculum planning guide; (c) the creation of a school district standard requiring environment education curriculum planning, development, implementation, and evaluation; (d) the creation of standards for secondary level teacher preparation programs in the environmental studies, and (e) the establishment of the Wisconsin Environmental Education Board. This board oversees environmental education programs and identifies needs and priorities for environmental education in the state and private sectors. Legislation was also passed to create the Wisconsin Center for Environmental Education. The center's role is to provide expertise to schools in the preparation of curricula and the preparation of inservice teachers (Engelson 1986).

Wisconsin is employing an infusion model that requires the systematic incorporation of EE into existing district curriculum plans. To support planning at the district level, Wisconsin has developed an EE curriculum planning guide that prescribes goals and objectives and suggests curricular and instructional strategies. Further, to a more limited extent, expertise has been made available to district planning units. As of fall 1990, all school districts in Wisconsin were required to develop, adopt, and submit curriculum plans that infuse EE into the existing curricular framework. Accountability will be achieved every 3 years via on-site audits in which the district's written plans are compared with its educational practices. The Wisconsin legislature has also mandated periodic assessment of the environmental literacy of the state's teachers and students. Wisconsin seems to have made significant progress in its attempt to achieve systematic, comprehensive, statewide education about the environment in its public schools. Because of the recent timelines of Wisconsin's efforts, the outcomes are yet to be determined. The status of state-level activity in most other states is much less compelling.

EE in Schools: Insertion or Infusion?

School administrators and curricula planners must face the dilemma of curricula filled with the demands of an array of discipline-based, societal-based, and learner-based needs. How can EE curricula be reasonably framed? Can appropriate new courses be inserted into the curriculum? Can appropriate EE strategies be infused into existing curricula? Can existing curricula be appropriately modified, that is, "environmentalized"? The answer to all three questions is yes. In fact, all three approaches might well be needed to achieve a systematic, comprehensive curricular package.

Before dealing with generic curricular factors (e.g., scope and sequence, infusion), we review two EE instructional models built around the goal framework presented above. One model, the Case Study, was designed for infusion into existing K–12 curricula. The other model, Issue Investigation Skill, was designed to stand alone, requiring insertion into grade 6–12 curriculum. These strategies represent examples of approaches that can be used by curriculum planners in "environmentalizing" the curriculum. A comparison of each approach will allow the benefits and problems associated with each to emerge.

The EE Case Study Format

The case study is a teacher-directed analysis of a particular environmental issue. It is an instructional method that uses both primary and secondary sources to deliver issue-focused information and skills to the student. In other words, original sources are, at least initially, used by the teacher to develop a foundation of knowledge concerning the issue. Once students are oriented to the issue, the teacher provides students with the skills needed to investigate the issue on a class or small-group basis. Such a strategy could involve the students in a search for additional secondary information sources. Or, it could involve a class decision concerning information needed or questions needing answering at the local or community level. This could well lead to instruction on the development of survey instruments (questionnaires and/or opinionnaires) and the development of a survey that the entire class would administer within the community. Of course, this would lead to the collection of primary data that would be recorded and interpreted. Once class decisions are made concerning what should be done with respect to the issue, the time is ripe for citizenship action training and the eventual development of an action plan that may or may not be implemented, depending upon decisions made by the class or teacher. This, in short, describes a case study.

A model issue instruction case study for grades 5–12 has been formalized and published, that is, *A Science-Technology-Society Case Study: Municipal Solid Waste* (Ramsey, Hungerford, and Volk 1989). This case study provides a model for teachers who wish to prepare case studies using issues of their choice.

The case study provides the teacher with a substantial amount of flexibility and control. The extent to which the issue is dealt with is in the hands of the teacher. The teacher can choose the issue, determine the methods to be used, make decisions concerning the depth to which the issue will be studied, select the content area in which the area will be infused, and determine the length of time spent on the case study. Ample opportunities are available for both individual, large-group, or cooperative learning formats.

There is, however, a price to be paid for flexibility and control! The costs involve time, energy, and skill in putting the case study together. Most issue case studies are a do-it-yourself curriculum with the classroom teacher as the curriculum designer. Although students can be involved in the selection of a case study, that responsibility generally rests with the teacher, as does the responsibility for finding and selecting original sources such as video tapes, printed matter, guest speakers, panel members, films, field trips, or simulations. Decisions must be made about the specific learning outcomes desired. Handouts must be prepared. Evaluation instruments must be designed and evaluated. The development of a case study is not an easy task.

Another problem with the case study format relates to student interests. The teacher will not be able to meet the interests of all students using the case study format. This is rather a severe limitation when there are a number of students who would like to investigate issues other than the one being studied by the class. This limitation is counteracted by using the issue investigation skill format.

You might wonder how the case study infusion might work in the classroom. Consider Vignette 1 about a fifth grade teacher who developed and infused a case study into her curriculum. Her unit, The Timber Wolf Reintroduction Case Study, consisted of four parts beginning with science knowledge, progressing to processing information about and investigating the wolf issue, and culminating in decision making. Those components were integrated into an unfolding "storyline" that served as a

VIGNETTE 1

The Wisconsin Department of Natural Resources (WDNR) proposed the reintroduction of the timber wolf in several northern Wisconsin counties. This plan became the focus of a controversial issue throughout the region. A fifth grade teacher used that issue as the focus of her case study, The Timber Wolf Reintroduction Case Study. Instruction began with the natural history of the timber wolf and its ecological role in natural systems. The next level of instruction focused on students' learning how to identify the positions, beliefs, and values of players in the timber wolf issue, using an issue analysis strategy. This was followed by the construction of a concept map of important aspects of the issue. (These information-processing activities are designed to help students achieve in-depth understanding of the issue.) Collectively, these activities generated a comprehension of the issue as well as a number of questions that could become the focus of an investigation.

The next part of the case study, the problem-solving stage, involved the students in designing and carrying out an investigation based on the questions generated by the prior activities. The class decided to find out how many regional residents supported the reintroduction of the timber wolf. They randomly selected more than 300 residents in seven contiguous counties of northern Wisconsin. Hand-written cover letters and a typed questionnaire were prepared by the students and mailed to the selected residents.

More than 200 of the questionnaires were returned. Data were compiled, and a report of the findings was prepared and submitted to the WDNR as well as to regional newspapers. Some of the study's respondents sent the students stories and anecdotes about personal stories and other remembrances concerning wolves. A few of these individuals were invited to the class for presentations. As the case study unfolded, numerous language arts, social studies, creative writing, art, and math activities were conducted in addition to the numerous science lessons.

skeleton for a number of other interdisciplinary and multidisciplinary activities.

The Issue Investigation Skill Format

The case study approach to issue investigation focuses on only issue category, for example, timber wolf reintroduction. The issue itself is the intent of case study instruction. As such, the instructional activities are *issue specific*. In contrast, the investigation skill methodology employs a broader, more generalizable approach to the process of issue investigation. The intent of the issue investigation methodology is to develop in students the capabilities (skills) in issue investigation and resolution —capabilities that can be used throughout their lives as citizens.

Like the case study approach, the investigation skill format uses instructional activities structured around the four issue instruction goal levels described earlier. However, unlike the case study approach, the investigation skill method defines, practices, and applies the generic knowledge and skills needed by students to independently investigate and resolve issues. This process culminates in an investigation of a science-related social issue of the student's own choosing and the development of an action plan for resolving that issue.

The investigation skill methodology for grades 6–12 has been formalized and published, that is, *Investigating and Evaluating Environmental Issues and Actions: Skill Development Modules* (Hungerford et al. 1988). The investigation skill program is organized into a series of six modules. The modules are interdisciplinary in nature and introduce students to the characteristics of issues and the skills needed for obtaining and processing information, investigating and analyzing issues, and issue resolution. The following descriptions provide a brief overview of each module:

Module I. An Introduction to Issue Investigation. Students discriminate among events, problems, and issues. The impact of beliefs and values on environmental issues is explored and issue analysis is introduced and practiced. The concept of "interaction," so crucial in the sciences and social studies, is also introduced, demonstrated, and applied.

Module II. The Basics of Issue Investigation. Students identify environmental issues, write research questions, learn how to gain information from secondary sources as well as learn how to compare and evaluate information sources.

Module III. Using Surveys, Opinionnaires, and Questionnaires. Students learn how to obtain information using primary methods of investigation. Initially, they learn how to develop surveys, opinionnaires, and questionnaires. Subsequently, they learn sampling techniques and how to administer data collection instruments, as well as how to record those data.

Module IV. Interpreting Data. Students learn how to draw conclusions, make inferences, and formulate recommendations. Further, they learn how to produce and interpret graphs.

Module V. Investigating an Issue. Students autonomously select and investigate an environmental issue. This process involves the application and synthesis of the skills learned thus far.

Module VI. Issue Resolution Training. Students learn the major methods of citizenship action, analyze the effectiveness of individual versus group action, and develop issue resolution action plans. This "action plan" is evaluated against predetermined criteria to assess social, cultural, and ecological implications of citizenship actions. Finally, the action plan may be implemented at the discretion of the student.

This skill development approach provides a powerful vehicle for the investigation of a multitude of different science-related issues by students. The effectiveness of this methodology has been validated by research findings that indicate that issue investigation training fostered responsible and independent citizenship behavior on the part of seventh and eighth grade students (Ramsey, Hungerford, and Tomera 1981). The investigation skill approach is probably more effective at fostering responsible citizenship behavior than the issue case study. The case study typically focuses on a single issue selected by the teacher, thus delimiting exposure to an array of issues investigated by classmates and the ownership that comes with identifying and investigating one's own issue.

Most instructional methods, including the investigation skill approach, have a variety of problems and limitations. Teachers have typically found that a complete 18-week semester is needed to complete the instructional objectives in the skill development program. Thus, this type of program must be inserted into the curriculum. Further, a variety of classroom management skills are critical in those aspects of instruction where the teacher acts as a facilitator between resources and students in the process of investigating an array of science-related social issues. In particular, some teachers have found it difficult to make the transition from direct instruction to a role that demands advising and consulting. Allowing students to investigate issues independently is evidently viewed as unfamiliar departure from the "traditional" classroom management practiced by many teachers.

Consider the vignettes of individuals or teams of students conducting independent investigations as a function of learning issue investigation skills in the middle school classroom. Vignette 1 serves as an example of how environmental education can be *infused* into the classroom. The curricular vehicle, in this case, was a teacher-developed case study that closely adhered to the theoretical framework described earlier. Vignettes 2 and 3 serve as examples of products of instruction that was *inserted* into a middle school curriculum using the issue investigation skill strategy. The instructional examples presented above describe examples of environmental education in the classroom. However, some very important things are missing, namely, the actual planning and decision making about scope and sequence, infusion or insertion, as well as an array of other curricular and instructional questions.

Most administrators and curriculum planners believe it is simply not realistic to consider the insertion of EE into an already overloaded curriculum. That question will not be discussed. Rather, the process of infusing EE into the existing curricular framework will be explored in some depth in the following section.

Considering EE Infusion

Infusion is a relatively simple process to understand but a rather complex process to accomplish. *Simply stated, infusion refers to the integration of content and skills into existing courses in a manner as to focus on that content (and/or skills) without jeopardizing the integrity of the courses themselves.* In the case of environmental education, the educator carefully analyzes existing courses for places where environmental content and associated skills could be incorporated.

A key component in the infusion process rests with the faculty of the school attempting to incorporate an infused environmental education program. Any comprehensive infusion strategy demands a great deal of cooperation from staff members who are going to be responsible for the infused program. The faculty must be sympathetic toward the infusion and the members of that faculty must be willing to work cooperatively to build a plan for infusion and see that that plan is carried out. A major ingredient of that "plan" must be to respect the integrity of the scope and sequence in a manner that guarantees that instruction will proceed logically across content areas. Sometimes this can be accomplished by teachers working independently of others but often it necessitates "team teaching," with instructors from two or more content areas working cooperatively to deliver well-thought-out instruction.

If time and other resources permit, an "infusion institute" can be designed that would permit faculty members to be trained in infusion techniques and provide time for them to plan for the infusion of environmental content and skills. In addition, such an institute would allow participants to identify barriers to infusion and develop strategies for removing those barriers. This strategy will often counteract a common behavior that consists of looking for problems more diligently than looking for solutions. Human nature being what it is, excuses are far easier to come by than solutions to problems.

VIGNETTE 2

An Illinois community was engaged in deciding what combination of recreational, agricultural, commercial, industrial, and wildlife habitat usage was appropriate for a section of state-owned land adjacent to a local river. A team of middle school students assessed community residents' opinions concerning the issue. Then, using the study's findings, they developed a "master plan" for the use and development of that public land. The plan was then submitted and defended at a public hearing sponsored by the State Department of Conservation. Among the farmers, boaters, bird watchers, businesspeople, and others who spoke at the hearing, the students were the only participants who presented a proposal founded on data-based decision making.

VIGNETTE 3

Illegal dumping has become an issue in many states. In southern Illinois, a county board of commissioners received several complaints from residents concerning illegal dumping on rural roads, abandoned strip mines, and creeks. A local eighth grade student decided to determine the extent of and the characteristics associated with the county's illegal dumping activity. The student's questionnaire, along with a copy of a county map, was sent to each county township road commissioner. Each commissioner reported the locations of illegal dump sites within his township. The student then visited each site to determine the extent of agricultural, automotive, commercial, and household wastes. A report of the findings, along with photographic evidence, was prepared and submitted to the county board of commissioners and published in the local newspaper. Further, the student used the investigation's data as the basis of a school science fair project.

Some Insights into Infusion

Over the past several years, the authors of this document have spent a good part of their professional lives training faculty members in environmental content and issue investigation strategies. One of the things to come out of this training is the knowledge that environmental content and skills can often be integrated into existing courses without interfering with the content and skills desired by involved faculty members.

Where can important environmental content be infused? In a middle school in New Jersey, for example, there was interest in implementing environmental issue instruction using a team-teaching approach (infusing issue instruction into science, language arts, and social studies). The language arts teacher was skeptical; he was unsure whether this infusion would interfere with his program of skill development in the language arts. Even so, he agreed to study the components of issue investigation and respond to the challenge a day later. He came back to the group the next day and stated that the language processes involved in issue instruction would meet more than 50% of his course objectives. The social studies teacher, concerned that her students have an opportunity to study social problems, had no problem seeing the relationships that existed between environmental issues and social issues because all environmental issues have a strong social dimension. Of course, the science content was obvious.

In another instance where issue instruction was implemented in the middle school, the school librarian worked with the science teacher, assisting her with instruction in certain language skills and providing environmentally related secondary resources for the students. The librarian reported that she was astounded to find that the research skills of the issue-focused students were much better than the skills of other students. She was also impressed with the seriousness with which those students approached their library research. The students became so skilled in using secondary sources from the library that they did not need to be retaught library skills in subsequent years. One would not necessarily expect this kind of an outcome from an environmental program, but this is exactly what happened.

We can cite numerous examples of two teachers working cooperatively, typically, science teachers working with social studies teachers or language arts teachers to meet the needs of learners. In all instances, some form of infusion was involved. Usually, the science teacher prompted the team teaching and the infusion, but not always. Sometimes, the social studies teacher led the way. It matters not! Infusion took place and cooperative teaching occurred.

In other instances, teachers of home economics and agriculture have requested training for infusing environmental content into their subject matter areas. Many environmentally related issues are suitable for home economics instruction, for example, those having to do

TABLE 1.—Middle School Infusion Possibilities for Year One: Ecological Foundations and Man as an Ecological Factor

Outline topic	Science	Health	Social studies	Math	Language arts	Home economics	Agriculture
I. What is ecology? What do ecologists do?							
A. Defining "ecology"	X						
B. The role of ecologists	X		X				X
II. Individuals, populations, and levels of organization in ecology	X						
III. The "ecosystem concept" developed							
A. Importance of the concept	X						
B. Local/regional ecosystems	X						
C. Components of ecosystems	X						X
D. Ecological niches	X						X
E. Competition . . .	X						X
F. Tolerance ranges . . .	X						X
IV. Energy and ecosystems							
A. The need for energy . . .	X					X	X
B. The sun as the source . . .	X					X	X
C. Green plants as the basis . . .	X						X
D. Energy losses . . .	X					X	X
E. Net primary productivity . . .	X						X
V. Ecological succession . . .							
A. Succession as a natural phenomenon	X						X
B. Succession as an orderly phenomenon	X						
C. Major categories . . .	X						X
D. A comparison of stages	X						
VI. Populations and their dynamics	X						X
VII. Man as an ecological factor							
A. Man as a powerful variable	X		X				X
B. Man as an eruptive population	X		X	X			
C. Consequences of eruptive human populations	X		X			X	X
D. Man and the world's soils			X				X
E. Man and the world's forests	X		X				X
F. Man and the world's wetlands	X		X				X
G. Man and the world's wildlife	X		X	X			
H. Critical considerations . . .	X		X				X

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TABLE 2.—Middle School Infusion Possibilities for Year Two: Environmental Science and Environmental Health

Outline topic	Science	Health	Social studies	Math	Language arts	Home economics	Agriculture
I. Man: His history of resource consumption							
A. Early Man: hunters/gatherers			X				
B. Agricultural societies	X		X				X
C. Industrial societies	X		X				
D. Relation of population . . .	X	X	X	X		X	X
II. Soils and allied problems							
A. A definition . . .	X						X
B. Man's dependency . . .	X						X
C. Soil formation	X						X
D. Soil erosion	X						X
E. The link between human population/soil erosion			X				X
F. Soil conservation strategies							X
III. Water and allied problems							
A. The world's water supply	X		X				
B. Renewing the water supply	X		X				
C. Problems with water resources	X		X				X
D. Management strategies	X		X				X
E. Water conservation	X		X			X	X
IV. Food production and hunger							
A. The food that feeds the world	X		X			X	X
B. Food chain energy losses . . .	X					X	X
C. Characteristics of agricultural systems	X		X				X
D. World food problems	X	X	X			X	X
E. The green revolution	X						X
F. . . . unconventional food plants	X					X	X
G. Increasing utilization of fish	X					X	X
H. Sustainable agriculture			X				X
I. Responsibilities of the individual . . .			X				X
V. Forest resources							
A. Importance . . .	X		X				
B. Short-term vs. long-term benefits			X				
C. The world's forests			X				X
VI. Air pollution							
A. Sources of air pollution	X		X				
B. Major pollutants	X	X					
C. Impact on human health	X	X					
D. Acid precipitation	X	X					X
E. Indoor air pollution	X	X				X	
F. Ozone depletion	X	X				X	

with energy consumption and conservation, the relationships between human reproduction and family living, environmentally sound consumer behavior, home sanitation and disease, and toxic chemicals and food production. In agriculture, numerous environmental issues are available for infusion, for example, issues associated with food production, soil erosion, desertification, herbicides, insecticides, livestock grazing, and loss of agricultural land due to construction. Courses such as home economics and agriculture can play an important part in an overall infusion of environmental education in the middle school curriculum.

Outline topic	Science	Health	Social studies	Math	Language arts	Home economics	Agriculture
VII. Water pollution							
A. Sources of surface pollution	X						X
B. Human diseases traced to . . .		X				X	
C. Oceanic pollution		X					
D. Groundwater pollution	X	X				X	X
E. Waste water treatment	X	X				X	
VIII. Noise pollution							
A. Sources and levels	X						
B. Effect of noise on humans	X	X				X	
C. Noise control	X	X	X			X	
IX. Solid waste disposal							
A. Solid waste defined		X				X	
B. Sources of solid waste		X				X	X
C. Sources of municipal waste		X				X	
D. Affluent/nonaffluent nations			X	X			
E. Methods of municipal waste disposal		X				X	
F. Source reduction of wastes	X		X			X	X
G. Issues surrounding solid waste management	X	X	X			X	X
H. The individual . . .			X			X	X
X. Hazardous waste							
A. Hazardous waste defined	X	X				X	X
B. Sources of hazardous waste	X					X	X
C. Hazardous waste disposal the past	X					X	X
D. Hazardous waste today	X					X	X
E. Issues surrounding hazardous waste disposal	X		X			X	X
F. The individual . . .			X			X	X
XI. Human population growth and control							
A. No population can sustain limitless growth	X			X		X	
B. Human population dynamics	X		X	X		X	
C. Age structure	X		X	X			
D. Issues associated with . . .	X		X			X	X
E. Economic development and population changes			X	X		X	
F. Advantages of family planning combined with economic development		X	X			X	
G. Immigration and population dynamics			X				
H. Birth control and population dynamics		X				X	
I. Major issues . . .	X	X	X			X	

Inspecting a Middle School Scope and Sequence for Infusion Possibilities

To provide some assistance to schools that desire to infuse environmental content across the curriculum, we constructed a series of three tables that provide insight into the potential for infusion. A 3-year scope and sequence appropriate for middle school students are illustrated. This range, from ages 10 to 15, was targeted because of cognitive maturation on the part of middle school students and the perception that the middle school curriculum is more flexible than the secondary school curriculum. The scope and sequence begins in

TABLE 3.—Middle School Infusion Possibilities for Year Three: Issue Investigation and Citizenship Action Training

Outline topic	Science	Health	Social studies	Math	Language arts	Home economics	Agriculture
I. Environmental problem solving							
A. Human-environment interactions	X		X				
B. Quality of life vs. quality of the environment	X	X	X			X	X
C. Environmental problems and issues	X	X	X			X	X
D. Issue analysis	X	X	X			X	X
E. Examples of analyzed issues	X	X	X			X	X
F. Applying issue analysis skills	X	X	X			X	X
II. Identifying issues and preparing research questions							
A. Identifying environmental issues	X	X	X			X	X
B. Identifying variables associated with environmental issues	X		X				
C. Writing research questions	X		X		X		
III. Using secondary sources							
A. Secondary sources of issue-related information					X		
B. Processing information from secondary sources			X		X		
C. Reporting secondary source information					X		
IV. Using primary sources							
A. Surveys, questionnaires, and opinionnaires	X		X		X		
B. The interview					X		
C. Selecting the population	X		X	X			
D. Procedures of sampling	X		X	X			
E. Data collection strategies	X		X				
F. Developing and using instruments/interviews	X	X	X		X	X	X
V. Interpreting data from environmental issue investigations							
A. Organizing data in data tables	X		X	X			
B. Communicating data by graphing	X		X	X			
C. Interpreting data	X		X		X		
D. Applying data-interpreting skills to issue-related data sets	X	X	X			X	X
VI. The independent investigation of a student-selected environmental issue							
A. Selecting an issue . . .	X	X	X		X	X	X
B. Writing research questions	X	X	X		X	X	X
C. Collecting secondary information			X		X		
D. Collecting primary information	X	X	X	X	X	X	X
E. Issue analysis/data interpretation	X		X	X	X		
F. Communication of results					X		
VII. Issue resolution: Skills and application							
A. Citizenship responses to issues and their effects	X	X	X			X	X
B. Principles of citizenship action			X				
C. Methods of citizenship action			X			X	X
D. Individual vs. group action		X	X			X	X
E. Guidelines for decision making	X	X	X			X	X
F. Applying issue-resolution skills		X	X	X		X	X

TABLE 4.—Wisconsin's EE Curriculum Model

Grade-level range	Subgoals	
	Major emphasis	Minor emphasis
K–3	Awareness Attitudes and values	Knowledge Citizen action skills Citizen action experience
3–6	Knowledge Attitudes and values	Awareness Citizen action skills Citizen action experience
6–9	Knowledge Citizen action skills Attitudes and experience	Awareness Citizen action experience
9–12	Citizen action skills Citizen action experience Attitudes and experience	Awareness Knowledge

year 1 with instruction focused on the discipline of ecology (Table 1). Year 2 (Table 2) focuses on environmental science and environmental health. Year 3 (Table 3) completes the sequence by focusing on environmental issue analysis, investigation, and resolution. (A complete K–12 scope and sequence, though possible, is beyond the scope of this article.) Further, the concepts and skills presented within the scope and sequence are tersely communicated. A complete explication of a similar scope and sequence can be found in Hungerford, Volk, and Ramsey (1990).

It should be understood that these tables show possibilities only! Educational needs and opportunities will vary from school to school and a given faculty may choose to infuse quite differently from what is shown in these tables.

One Last Comment

It should be clear that there are many opportunities for environmental education in the middle school curriculum. What about EE in the primary and intermediate elementary grades? Again, there are just as many "windows" for infusion. A number of EE curriculum packages exist that were designed to supplement existing curriculum. Among these are *Project Learning Tree, Project WILD-Elementary*, and *NatureScope*—all of which provide interdisciplinary activities and infusion ideas. What about the discipline-focused secondary school? *Project WILD-Secondary* is widely used as a curriculum supplement in high school science courses. Further, upper-level biology, chemistry, and physics courses present excellent opportunities for the infusion of teacher-developed case studies. For example, an acid rain case study (constructed in congruence with the EE goal hierarchy) might follow an "acids" unit in a chemistry course. But thoughtful curriculum planners know that episodic treatments only in certain courses must be avoided. Environmental education must be systematically constructed and theoretically valid to achieve its goals. Wisconsin (Engelson 1989) has proposed the infusion framework displayed in Table 4 to ensure systemic planning for that state's curriculum planners.

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More Infusion Confusion: A Look at Environmental Education Curriculum Materials

DEBORAH A. SIMMONS

ABSTRACT: It is widely accepted among professionals that environmental education should be infused throughout the school curriculum at every grade level. Yet a great deal of evidence seems to indicate that this integration is not taking place. This paper suggests that the failure to infuse environmental education equally throughout the curriculum may be related, in part, to the types of instructional materials available.

One central tenant of environmental education is a commitment to its infusion throughout the school curriculum (Tanner 1974; Hungerford 1975; Jinks 1975; Stapp 1978; Hart 1981; Engleson 1985; Disinger 1987). The rationale for infusing environmental education is compelling: by incorporating environmental education throughout the total curriculum at every grade level, a more comprehensive treatment of environmental concerns can be accomplished. Moreover, such an approach also recognizes that environmental issues cut across traditional disciplinary lines and that developing an environmentally responsible citizenry involves acquiring knowledge, attitudes, and skills beyond that of a simple understanding of scientific or ecological principles.

According to Engleson (1985):

> Environmental education should permeate the entire curriculum with every subject area at every grade level dealing with the environment in some way. Some subject areas, by their very nature, present greater opportunities for infusion of environmental education, but all have a role to play.

Infusion allows an "environmentalization" of the total school curriculum. It also offers other practical benefits. In this approach, environmental education does not become another add-on to the curriculum, another subject that needs to be fit into an already overburdened schedule. Rather it takes only a little extra time to use environmental issues and concerns to teach skills and concepts within the normal scope and sequence of subject areas.

Philosophy versus Reality: The Practice of Infusion

Unfortunately, the data seem to suggest that environmental education has not been infused equally within the curriculum but tends to be treated mostly as an enrichment of the science program.

Ham and Sewing (1987–1988) asked teachers in western Idaho and eastern Washington to identify the curriculum areas in which environmental education should be taught. The area (subject) named by a majority of the respondents (62.6 percent) was science. The next most frequently mentioned subject, social studies, was named by 36.3 percent of the respondents. Other subject areas named with much less frequency were health (3.3 percent), language arts (2.2 percent), and reading (2.2 percent).

Similar results were found when northern Illinois teachers were asked to rate the degree to which outdoor/environmental education should be integrated into various cur-

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ricular areas (Simmons 1988). Over three-quarters of the teachers felt environmental education was most appropriately integrated into the sciences. As with the data collected by Ham and Sewing, other curricular areas, including social studies, language arts, and art, were mentioned far less frequently (only 30 to 40% of the time). Still other areas, such as math and music, were named less than 20% of the time, indicating that most teachers do not believe that environmental education can or should be incorporated into these areas.

Classroom teachers are not alone, however, in favoring science as the subject in which to teach environmental education. When surveyed by Ham, Langseth, and Fazio (1985), directors of environmental education resident camps cited science activities as the primary curriculum focus at the camps. More specifically, these camp directors emphasized the teaching of environmental education within the biological sciences (93 percent), art (55.8 percent), physical sciences (46.5 percent), physical education (41.9 percent), math (32.6 percent), social studies (32.6 percent), language arts (30.2 percent), history (25.6 percent), and health (20.9 percent).

As one might expect, the degree to which environmental education is actually integrated into schools closely follows these perceptions. Ham and Sewing (1987–1988) found that respondents most frequently use environmental education within science (79.1 percent), followed by social studies (58.2 percent), reading (18.7 percent), language arts (12.1 percent), art (6.6 percent), health (5.5 percent), math (4.4 percent), music (1.1 percent), and physical education (1.1 percent). Likewise, in a survey of teachers using Project WILD, Cantrell (1987) found that these activities were being used primarily within science classes (77 percent of the time), whereas other subject areas fell far behind (math 10 percent; art, health, and physical education each 8 percent; language arts 5 percent; social studies only 2 percent of the time).

There are a number of possible explanations for the lack of curricular integration. One, of course, is that those who teach environmental education are, for the most part, science teachers who use environmental education strategies within their classrooms. Tewksbury and Harris (1982) found that 60 percent of those delivering the environmental education program in northern New York were science teachers; 31 percent were social studies teachers. Similar results were found in a study of environmental education in Virginia (Pettus and Schwaab 1978–1979). Somewhat of a chicken and the egg explanation for this situation results: science teachers teach environmental education; therefore environmental education is taught within science classes.

Ham and Sewing (1987–1988) suggest that the way in which teachers are trained may also have a significant influence on the practice of environmental education within classrooms. They argue that when environmental education is included within teacher preparation programs it is usually placed in science methods classes. Thus, beginning teachers are naturally drawn to the conclusion that environmental education fits best in the science curriculum.

An Alternative Explanation

Although teacher training helps determine whether environmental education will be incorporated in the classroom, the availability of suitable curriculum materials is equally important. Classroom teachers obtain instructional materials from a variety of sources, such as the school district and state or local agencies, and then adapt them as they see fit. In environmental education, there are a number of nationally distributed curriculum packages, such as Project Learning Tree (1987), Project WILD (1985), Project WILD Aquatics (1987), and Living Lightly in the City (O'Connor 1985; O'Connor and McGlauflin 1982). Unless the school district or classroom teacher has developed locally oriented environmental education materials, these nationally distributed materials may be the only instructional resources available. As such, they represent the environmental education community's definition of environmental education put into practice.

Some curriculum materials may do a better job than others of encouraging infusion. For example, the classroom teacher wishing to integrate environmental education into the social studies program need only refer to the Project WILD materials: forty-four different social studies activities are listed. But are environmental education curriculum materials providing such activities for a variety of school subjects?

A Closer Look at Available Curriculum Materials

To examine the relative number of environmental education activities available to the classroom teacher in the various subject areas, curriculum materials designed for use in the elementary school (K–6) classrooms were chosen as illustrative examples. Two additional selection criteria also had to be met: one, the curriculum project had to be widely distributed and as such available to a larger proportion of classroom teachers; two, a subject index of activities had to be provided as part of the published materials available to teachers. This subject index helped determine the proportionate number of activities available for infusion into the various curricular areas. Four curriculum projects, each meeting the above criteria, were selected for examination: Project Learning Tree (1987), Project WILD (1985), Project WILD Aquatics (1987), and Living Lightly in the City (O'Connor, 1985; O'Connor and McGlauflin 1982).

Table 1 displays the number of activities in each subject category for the four curriculum packages. The tabulation for each of these curriculum packages is based on the subject categorization published as part of the curriculum materials. The table was constructed by simply to-

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TABLE 1.—Number of Available Environmental Education Activities Categorized by School Subject Area

	Curriculum package							
	Project Learning Tree (*n* = 89)		Project WILD (*n* = 81)		Living Lightly in the City[a] (*n* = 102)		Project WILD Aquatics (*n* = 37[b])	
Curriculum area	*n*	%	*n*	%	*n*	%	*n*	%
Science	55	(61.8)	76	(93.8)	77	(75.5)	33	(89.2)
Social studies	48	(53.9)	44	(54.3)	72	(70.6)	13	(35.1)
Language arts	24	(26.9)	54	(66.7)	37	(36.3)	13	(35.1)
Mathematics	21	(23.6)	17	(21.0)	21	(20.6)	10	(21.6)
Art	16	(17.9)	22	(27.1)	23	(22.5)	4	(10.8)
Health	10	(11.2)	3	(3.7)	NA[c]		2	(5.4)

Note: Because most activities are categorized under more than one subject, percentages total more than 100.

[a] For the elementary school level, two volumes (K-3 and 4-6) were published. The table reflects combined totals for both volumes (K-6).

[b] Project WILD Aquatics include activities for K-12. Only those activities listed for K-6 were included here.

[c] In this case, health is not listed as a subject category.

taling the activities listed under each subject area and dividing that number by the total number of activities in the curriculum package. Because most activities are categorized under more than one subject area, percentages often total more than 100 percent.

As Table 1 indicates, the overwhelming majority of environment education activities are science oriented: nearly 94 percent of the Project WILD activities and 89 percent of the Project WILD Aquatics activities are listed under the subject of science. Social studies-oriented activities are the next most frequently listed category. Across the various curriculum packages, a little over half of the activities are identified for use in social studies. Although Project WILD categorizes two-thirds (66.7 percent) of its activities as appropriate for language arts instruction, the figure is much smaller for the other three curriculum packages (ranging from 26.9 percent to 36.3 percent). Less than 25 percent of the activities are listed as appropriate for math and art, while less than 10 percent of the activities are seen as fitting within the health program.

Conclusions

As a field, environmental education has made great strides over the last two decades in its efforts to become accepted as an integral element of the educational process. The availability of curricula with strong national reputations such as those discussed here has played an essential role in getting environmental education into the schools. In the last ten years, over 80,000 educators have been introduced to Project Learning Tree; roughly 100,000 educators have participated in Project WILD workshops (Charles 1987). However, this paper has pointed to the need within the environmental education community to constantly monitor our progress and make certain that our actions are consistent with what we declare to be important to the field.

If environmental education is committed to infusion, a greater variety of curriculum materials clearly needs to be developed or adapted for use within non-science subject areas. When new curriculum development projects are begun, a primary goal should be developing activities especially for mathematics, art, music, and health.

Of course, no one curriculum package can or should meet all needs. Various materials emphasize different subject areas. For example, Project WILD is strong in both science and language arts, whereas Living Lightly in the City emphasizes social studies activities. Consequently, when teachers are introduced to environmental education, a concerted effort should be made to make them aware of the wide variety of materials available. To expedite this effort, handbooks such as the *Avoiding Infusion Confusion* series (Hayden, Oltman, Thompson-Tucker, and Wood 1987) are particularly useful.

Finally, even though environmental education activities may be used in more than one subject area, by emphasizing the sciences in curriculum materials, many teachers who are fearful of science may be scared away. Teachers must be *shown* that a strong science background is not a prerequisite for teaching environmental education.

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VIEWPOINT

What Research Says to the Educator

Part Two: Environmental Education and the Affective Domain

LOUIS A. IOZZI

*In part one of this article series (*Journal of Environmental Education, *Spring 1989), Iozzi stressed the importance of the affective domain in environmental education and discussed the major research conducted on this topic over the last twenty years. In this second and final article, Iozzi discusses the practical implications of this research for the educator and makes several recommendations.*—MM.

Recommendation 1. Infuse environmental education with a focus on the affective domain into existing curricula at all education levels—kindergarten (before, if possible) through senior high school. Environmental problems are largely social problems and, to a lesser degree, problems for science and technology. Science and technology have advanced to the point that those who work with those tools can effectively solve a vast majority of the world's environmental problems. But, they cannot do it alone. Major obstacles to improving environmental quality are existing societal attitudes, values, and lifestyles. Moreover, scientists and engineers can tell us what *can* be done; society must determine what, among the various alternatives, *should* be done. "Can" questions are essentially cognitive questions; "should" questions are values questions. Environmental attitudes and values issues must be important and prominent aspects of education programs taught in our nation's schools.

However, environmental education must be included in more than just science and social science programs—the subject areas that most comonly address environmental issues in our nation's schools. Rather, environmental education must be infused, as appropriate, into *all* subjects taught in our schools. Most scholars in environmental education promote a holistic approach to dealing with environmental issues, whereas only a few advocate that this subject should be added as a separate course of study to an already overcrowded school curriculum. Of course, this does not mean that separate elective courses at the secondary school level are not valuable or important. Indeed, such courses are very worthwhile for students interested in learning more about the environment than is taught in the school curriculum.

Even though science and social studies teachers have for some time included environmental issues and topics in their programs of study, few of them focus on the affective dimensions of environmental education. Many of the examples given throughout this paper will be appropriate for those subject areas. The following examples should be particularly useful for reading, language arts, music and art. Of course, they can also be easily adapted for use in science and social science classrooms as well.

In reading and language arts, there are numerous books—far too many to mention here—available for children at all grade and reading levels that deal with environmental themes, problems, and issues. Many of these books can be found in a school or local library. Children can certainly be taught reading skills using books such as these to supplement the basal reading text in use. Besides, children enjoy reading about issues and problems that are happening now—issues and problems that they see in television programs, in the newspapers, and hear their parents discuss at home.

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There are also many books that are not specifically environmental but that do present many opportunities to examine and analyze environmental attitudes and values. The environmentally atuned and astute teacher can find opportunities in almost any book for examining, analyzing, and discussing environmental attitudes. For example, almost every story describes—often in great detail—the environment in which the story takes place. At such points in the book, would it not be appropriate to discuss the environment described? Such questions as the following are very useful:

- How does the environment described in the book compare with the environment surrounding our school?
- Which environment do you prefer or like best? Why?
- What would you do to change the environment described in the story to improve it? How would you do it? How do you think the people in the story might feel about the changes you suggest?
- What kinds of practices and behaviors may have contributed to the deterioration of the environment described in the book? Around our school?
- From what you know about the environment described (or illustrated) in the book, what could you say about the environmental attitudes of the various characters in the book? How do their attitudes about the environment compare with yours? Who has more positive environmental attitudes—you or the characters in the book? How do you know?

Questions such as these are also very useful for helping children develop thinking skills, including critical and analytical thinking, as well as problem solving and decisionmaking skills. Of course, these are only general examples to help "spark your imagination" and creativity. Moreover, such questions need to be adapted to such things as the varying grade levels and intellectual levels of the students involved.

Students can write about environmental topics. They can write alternate endings to stories that describe or deal with less preferred environments. They can write poems about the environment—haiku, cinquain, and diamante are particularly effective at all grade levels. Students can also write about how they feel when they see different environments, how a deteriorating environment might affect different kinds of plants and animals, or how plants and animals might have to adapt to environmental changes. (Don't neglect to include people.) A process approach to teaching writing, combined with environmental issues and themes, can be a powerful technique in the hands of a skilled teacher.

Art and music provide numerous interesting and exciting opportunities for dealing with the affective dimensions of environmental education. Children can draw how they feel in a poor environment and then draw contrasting pictures showing how they feel in a nice environment. They can draw "before" and "after" pictures of different environments. Artists have one great advantage over photographers: photographers can only photograph what is; artists can paint or draw what can or should be. Hence, children can draw pictures illustrating how they would improve an environment or project into the future what could happen—depending on the environment and dominant societal environmental values and attitudes.

There are many songs that deal with the environment that can be included in school music programs. Besides, if you can't find any appropriate songs, write some! There are numerous recordings by such well-known artists as John Denver, Pete Seeger, Bruce Springsteen, and others that can be used in a music program. Again, a series of compare and contrast types of activities can be very useful. For example, students can compare the lyrics of such old favorites as "America the Beautiful" with the lyrics describing present-day conditions expressed in many of the newer songs. How do the various messages differ? How did the times differ when "America the Beautiful" was written and when Bruce Springsteen wrote "My Home Town"? Other questions might include the following:

- How do these different songs make you feel about the environment?
- How has the environment changed since this song was written? Is it better? Worse? Why? What brought about the changes? Why do you feel that way?

One caution: the lyrics to some modern songs can be *most inappropriate* for school use. Be sure to examine thoroughly the words to any songs and/or recordings before using them in school.

A balanced approach to environmental education requires that we teach for both cognitive and affective growth and development. Thus, research suggests that a comprehensive approach to environmental education might focus upon the following characteristics shown in Table 1.

Because important attitudes are learned and formed early in life, I suggest that the greatest emphasis be placed on the affective, rather than the cognitive, domain during the elementary school and middle/junior high school years. In senior high school, positive environmental attitudes and values presented during the lower grades should be reinforced and developed further, but increased emphasis should be placed on developing the cognitive aspects of environmental education (see Figure 1).

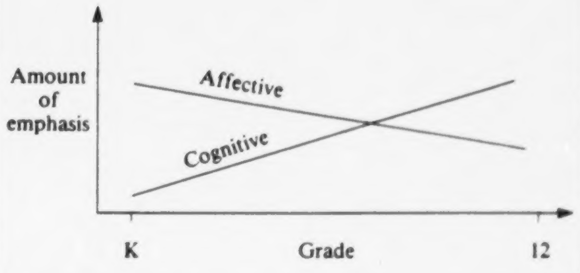
Figure 1 clearly indicates that both the cognitive and affective domains are always taught simultaneously at all grade levels. Of course, at no grade level is environmental knowledge totally ignored. This is true for environmental attitudes and values as well. The only differences among grade levels are the relative amount of *emphasis* placed on the cognitive and affective dimensions of environmental education.

It is again helpful to note the essence of the Eiss and Harbeck model (1969)

TABLE 1.—Program Emphasis in Environmental Education

Grade level	Suggested environmental emphasis
Preschool	Awareness of immediate environment and classroom
K-3	The school environment, school grounds, nearby community
4-6	Total community and statewide environments and problems
7-9	State and national environments and environmental problems
10-12	National and international environments and environmental problems; global environments and interdependence

FIGURE 1.—Relative Emphasis on the Cognitive Domain and the Affective Domain at Different Grade Levels



that was discussed in part one of this article (Iozzi, 1989) and how it relates to environmental education. That is, in the final analysis, the key to the total teaching-learning process is the affective domain.

Recommendation 2. Use values-analysis activities to help students understand their own environmental values and to help them determine how to improve them. The following is one approach to dealing with values education in general and with environmental values in particular. This approach utilizes values clarification, values analysis, and compare and contrast types of activities.

Step 1: Awareness/identification of personal environmental values. This first step is designed to help the student understand his/her values system as it relates to the environment and/or environmental issues. Clearly, unless the student has some idea about what he/she values, it would be difficult—perhaps impossible—to know how those values and resultant behaviors impact the environment.

Values clarification seems to be the most frequently used approach among teachers involved in values education in schools. It was first developed by Louis Raths and is currently promoted nationally by Sidney Simon, Howard Kirschenbaum, and others.[1]

Step 2: Analysis of how personal values/behaviors impact on the environment. In this step, students analyze how their environmental attitudes affect their behaviors and how these attitudes and behaviors collectively impact on the environment. The following example illustrates this point:

After completing one or more values clarification activities (Step 1, above), an elementary school student realizes that, rather than anything else, he prefers to watch television after school. A senior high school student, rather than anything else, prefers to ride around for hours after school in his car. For each case, the students are guided to (a) identify the components of one aspect of their values system; (b) identify a dominant value (e.g., riding around or watching television); and (c) relate their values to a behavior that places reasonably high stresses on energy resources. With these findings, the students then proceed logically to the third step in this analysis process.

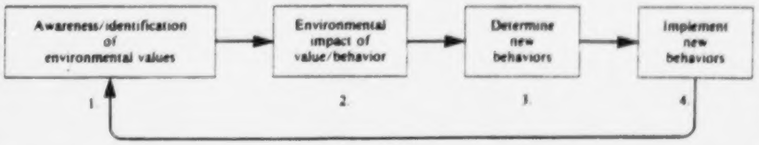
Step 3: Determine what behaviors need to be modified to become a more environmentally responsible person. In this step, the student identifies alternative behaviors and analyzes how each of them might impact on the environment. Values clarification activities could also be of assistance during this aspect of the process. For example, alternatives could be listed, ranked according to most responsible/least negative environmental impact/preferred alternative, and so forth. Eventually, the most preferred *and* most environmentally sound behavior alternative is identified.

Using the previous examples, the younger boy might decide that he could reduce his television watching by 50 percent, and the older boy might determine that he could reduce his "driving around" time. In either case, an energy savings can be realized. The "television addict," on the other hand, might decide to listen to a transistor radio, while "ride around Ronnie" might decide to get a smaller car or even ride around on a bicycle. Again the result of either or both of these new behaviors would be more environmentally responsible and result in energy savings.

Step 4: Implementation. Take action and implement the new behavior. Perhaps a fifth and last step might include a feedback loop in which the student periodically repeats the entire procedure as it relates to the *same environmental issue* (see Figure 2).

Recommendation 3: Environmental problems and issues are largely moral ones. Include activities to help students develop moral maturity as it relates to environmental problem solving and decisionmaking. In dealing with most problem solving and decisionmaking activities in school, a major deficiency is that the examples and exercises utilized are too neat, too tidy, too textbookish and unrealistic. Hence, they are of relatively little value in teaching students how to deal with real-life ("messy") problems. Real-world environmental problems are, for the most part, decisionmaking problems focusing on moral questions.

FIGURE 2.—A Values Analysis Approach to Environmental Education


Awareness/identification of environmental values
Environmental impact of value/behavior
Determine new behaviors
Implement new behaviors
1
2
3
4

Schools have typically resisted attempts to deal systematically with values education in general and, to an even greater extent, moral education. This does not mean that schools do not teach values—general values or moral values. Rather, teachers constantly teach moral values (right, wrong, good, bad, etc.) everyday. Yet, when someone suggests that values be taught systematically and deliberately in the classroom, the tensions build very rapidly. Unless we recognize environmental problems for what they really are—moral values problems—it is doubtful that any real progress will be made in the area of environmental quality in both the near and distant future.

With the above in mind, Lawrence Kohlberg (1958, 1969, 1971, 1976) has elaborated upon the early work of Jean Piaget (1932) and has identified a stage theory of moral reasoning. According to Kohlberg, just as people progress through a series of stages in their ability to think and reason (Inhelder and Piaget 1958; Piaget and Inhelder 1969; Piaget 1977), they also progress through a series of stages in their ability to make moral judgments. Space does not permit a meaningful discussion of Kohlberg's work. However, a brief and highly condensed description of his stages is necessary to grasp the significance and usefulness of his work for schools and for environmental education programs.

According to Kohlberg, people progress through the following moral stages:

Stage 1

Punishment and obedience.
Right is what authorities command.
Be good to avoid punishment.

Stage 2

"Back scratching."
What's right is what's good for me.
"Eye for an eye"; "Tooth for a tooth."

Stage 3

Conformity.
What's right is what others expect of me.
Be kind and considerate to others. Good intentions.

Stage 4

Law and order.
Do your duty. Set a good example.
Respect for authority. Follow the rules.

Stage 5

Social contract.
Emphasis on democratic ethic.
Respect for self and others.

Stage 6

Universal justice.

It should be noted that Kohlberg and others have found that most of society functions largely at the lower, egocentric stages: stages 2, 3, and 4. Very few people achieve stage 6 reasoning (highest sociocentric stage).

At what stage would you place most decisions about environmental matters? Stage 2? Perhaps stage 3? Do you think that the environment would benefit if most of society would reason at stage 5 or even stage 4 when it comes to environmental decisionmaking?

Research has shown that children can be induced to reason at increasingly higher stages by participating in various types of activities (Blatt and Kohlberg 1971; Iozzi 1987, 1982). One useful approach is the dilemma/scenario discussion activity. In this approach, students are presented with a moral dilemma (a short scenario problem) and are asked to determine what should be done to resolve the dilemma and why. In the process of attempting to resolve the dilemma by interacting with their colleagues according to carefully prescribed procedures, the students are challenged to function at higher increments of moral reasoning. As a result of such activities, moral growth is achieved.[2]

Recommendation 4: Include outdoor experiences whenever possible. However, do not neglect the classroom environment. There is overwhelming research to support the fact that children not only enjoy outdoor experiences but benefit from it in many ways. So, don't just talk about the environment; go outside and touch it, smell it, and feel it.

At the lower grades, walking tours around the school grounds can be very rewarding for children. Examination of their surroundings provides students with opportunities to observe and discuss what they like, dislike, and would like to improve about their surroundings. Older children can be taken on day-long field trips to a variety of sites to learn firsthand about different environments and environmental problems. Such trips need not be to pristine natural areas only; visits to environments not usually considered for field trips can be most rewarding. If your school is located in a rural or suburban environment, why not take a field trip to a big city?

Students can compare and contrast the different environments that they visit. Again, a series of questions to help students systematically conduct their investigations is more than helpful; it's a necessity.

Don't forget the classroom. What do the students like about it? Why? What do they like about other classroom environments? Why? What do they dislike about their classroom environment? Why? How would they improve it? Are the suggestions feasible? Well, why not try to implement the changes?

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What are some of the nicest things in the classroom? Why do they like them? What is the friendliest thing in the classroom? What is the most threatening? (I hope it's not the teacher—but you might be surprised!).

Resident camping experiences can also be very effective and rewarding environmental activities. They are not essential, however, for having your students explore the outdoor environment. For information about nearby resident outdoor education facilities, contact your state environmental education coordinator at the state education department.

Recommendation 5: All children benefit from similar types of environmental education learning experiences regardless of socio-economic status, age, place of residence, or gender. However, particular attention should be given to the needs of minority students, and those from different cultural backgrounds. One should also be careful to avoid sex stereotyping. While research generally supports the position that there are few, if any, differences among students and environmental values as they relate to socioeconomic status, age, place of residence, or gender, this area provides some particularly challenging problems for teachers.

For example, it is very difficult to get children to relate to the concept of overconsumption of natural resources when they do not have much access to resources such as food and do not enjoy a reasonably decent standard of living. Talking about forests and beaches is meaningless to children who never get to see them—even when they are relatively nearby. How can the poor be sympathetic toward saving the giant redwoods when the only giants they see are skyscrapers? It is difficult, maybe even impossible, to expect children to worry about the environment when they are worrying about their next meal. Maslow's hierarchy of needs theory is as appropriate today as it was when he formulated it several years ago.

Research has also shown that there is a "minority sub-culture" that is concerned more about social problems than about environmental problems. How does one teach or convince those in that group that environmental problems are important? If you are teaching in an area in which there are various sub-cultures who feel that environmental problems are "not my problem," there is a need to make them aware that environmental problems are, in fact, social problems as well. They need to understand that they too are part of the world community, that we are talking about *our* world and that we all have an important role to play in striving toward a quality environment for all. Unfortunately, convincing people of this is not easy.

It should be noted that poverty does not recognize skin color. There are many poor people from many ethnic and cultural groups. All poor people face similar problems and, as a result, all can be helped in similar ways. However, the solution to poverty is well beyond the control of the teacher. All the teacher can do, in reality, is try to help all students understand what poverty is, how it is caused, and some of the ways it can be eliminated. Most important, the teacher can help students to be more understanding and tolerant and to help those in need as much as possible.

Although all children seem to benefit from environmental education programs, one last caution deserves mention: the need to eliminate sex stereotypes. Research has shown quite clearly that attitudes are established in children at very early ages. Care needs to be taken to present a balanced approach or a gender neutral approach when discussing career opportunities offered in the various environment-related fields. Students should be made aware that there are both male and female foresters and wildlife managers—that all environmental careers are open to both sexes.

Recommendation 6: A variety of teaching techniques are useful for teaching environmental education in general and for dealing with the affective domain in particular. Inquiry methods that directly involve children in investigating real environmental problems and phenomena seem to be particularly effective. As one would expect, research shows that children learn best what they experience firsthand. Hence, students need to be directly involved in dealing with a variety of real-life environmental problems. This statement is equally valid for dealing with both the cognitive and the affective domains.

A case study approach is an interesting and particularly useful one that involves students directly in investigating real-life environmental problems and helps to develop good decisionmaking skills. Hungerford et al. have developed a program for junior/senior high school students that utilizes an investigative/case study/problem-solving approach to environmental education. This program includes, moreover, a great emphasis on the affective domain.[3]

Although inquiry methods seem to be particularly effective in helping children develop positive environmental attitudes and values, the essence of inquiry is effective questioning. Thus, the skillful use of various questioning strategies is extremely important for success in utilizing this method. Of particular importance is the need to ask questions at the appropriate stages of cognitive and moral development.

Just as it is important to ask questions at the higher levels of thinking to help students develop higher-order thinking skills (Bloom et al. 1956), it is also important to ask questions at the higher affective levels as well (Krathwohl et al. 1964).[4]

Teachers also need to do a little less talking and a little more listening in the classroom. Children learn not only from the teacher but from other children as well. The typical classroom discussion has been compared to a game of ping-pong in which the discussion moves back and forth from the teacher to the student (see Fig. 3). When this type of "discussion"

FIGURE 3.—Classroom Verbal Interaction: A "Ping-Pong" Approach

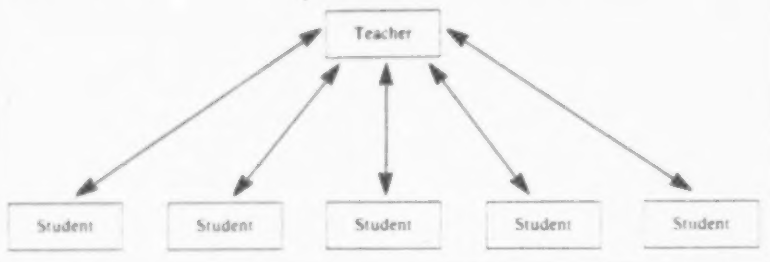
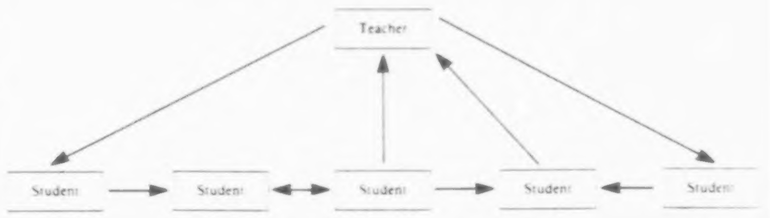


FIGURE 4.—Classroom Verbal Interaction: A "Basketball" Approach



prevails, students seldom, if ever, get an opportunity to talk to each other.

A preferred approach resembles the game of basketball, in which the teacher is one of the players, a critically important player, perhaps team captain and coach, all rolled into one. In this approach, the discussion moves about the room, with teacher and students interacting (see Figure 4).

Because the results achieved by students participating in simulation activities do not appear to be consistently superior to the results achieved by those taught using more traditional methods, simulations do tend to evoke greater student interest and student involvement than do more traditional approaches. Hence, it would seem that simulations should be more frequently employed in the teaching-learning process, particularly when dealing with attitudes and values.

A recent study conducted by Goldstein (1985) clearly established the fact that creative drama is a very effective means for helping children develop more mature levels of moral reasoning. This approach was superior to the more commonly used dilemma-discussion approach alone. Hence, role-play activities can be a useful and highly effective addition to the teacher's "arsenal" of effective teaching strategies for affective growth.

Recommendation 7: Employ television, video tapes, computers, films, audio tapes, and periodicals frequently in the classroom. Research has shown that media of all types constitute a powerful means for developing positive environmental attitudes and values in children. It has long been recognized that the more senses students can use, the better they learn. Media, which rely on both visual and auditory stimuli, such as televison, are particularly powerful.

Psychologists have found that we acquire 75 percent of what we know through sight; 13 percent through hearing; 6 percent through touch; 3 percent through smell; and 3 percent through taste. We acquire nearly all we know (88 percent) through a combination of seeing and hearing. Is there any wonder why television can be such a powerful tool for teachers?

Subscribing to a variety of environmental magazines and journals and making them available to students can provide added stimuli and benefits. Ask your school librarian for suggestions and listings of environment-related magazines and journals.[5]

Recommendation 8: Use many of the low cost and/or free materials and resources available. There are numerous sources of free, inexpensive, and/or low- to moderately priced materials available to teachers for school use. Exercise one caution, however. Sometimes the so-called free materials can be very costly in the way of the many hidden messages and biases they contain that could easily elude the nonspecialist. If at all in doubt about the accuracy of information and/or hidden messages in free materials, seek assistance from environmental education professionals, environmental education organizations, state environmental education coordinators, etc.[6]

Recommendation 9: Become actively involved in environmental activities and with environmental organizations. Research shows that teachers who periodically enroll in teacher in-service courses or who are actively involved with environmental education organizations routinely include environmental education in their teaching programs. It is also helpful to subscribe to and read environmental magazines and journals. *The Journal of Environmental Education, The Science Teacher, Science and Children*, and many of the other periodicals that were discussed or described in other parts of this article are particularly useful sources of information for educators.

Again, get involved. You'll gain the personal satisfaction of doing your part in a most important and rewarding endeavor—helping to ensure a quality environment for all.

NOTES

1. The following sources of information should be useful for employing values clarification in environmental education and in other areas as well.

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Harmin, M., H. Kirschenbaum, and S. Simon. 1973. *Clarifying values through subject matter.* Minneapolis, Minn.: Winston Press.

Hawley, R., and E. Hawley. 1975. *Human values in the classroom: A handbook for teachers.* New York: Hart Publishing Co.

Iozzi, L. A. 1987. *Science-technology-society: Preparing for tomorrow's world.* Longmont, Colo.: Sopris West.

Kirshenbaum, H., and S. Simon. 1973. *Readings in values clarification.* Minneapolis, Minn.: Winston Press.

Knapp, C. 1972. Attitudes and values in environmental education. *Journal of Environmental Education* 4(3):26–29.

Kniker, C. R. 1977. *You and values clarification.* Columbus, Ohio: Charles E. Merrill Publishing Co.

Raths, L., M. Harmin, and S. Simon. 1966. *Values and teaching.* Columbus, Ohio: Charles E. Merrill Publishing Co.

Scherer, D. 1978. *Personal values and environmental issues.* New York: Hart Publishing Co.

Simon, S., L. Hower, and H. Kirschenbaum. 1972. *Values clarification: A handbook of practical strategies for teachers and students.* New York: Hart Publishing Co.

2. The following references will be very useful for learning more about the dilemma discussion approach, how it works, why it works, and for developing your own moral dilemmas for general social problems and for dealing with environmental problems as well.

Beyer, B. 1976. Conducting moral discussions in the classroom. *Social Education* April: 195–202.

Fenton, E., A. Colby, and B. Speicher-Dubin. 1974. *Developing moral dilemmas for social studies classes.* Cambridge: Harvard University, Moral Education Research Foundation.

Galbraith, R., and T. Jones. 1976. *Moral reasoning: A teaching handbook for adapting Kohlberg to the classroom.* Anoka, Minn.: Greenhaven Press.

Hersh, R. H., D. Paolitto, and J. Reimer. 1979. *Promoting moral growth from Piaget to Kohlberg.* New York; Longman Press, Inc.

Iozzi, L. A. 1981. *The socio-scientific reasoning model.* Longmont, Co.: Sopris West.

———. 1987. *Decisions for today and tomorrow: Issues in science-technology-society.* Longmont, Co.: Sopris West.

The author has also developed a curriculum series, *Science-Technology-Society: Preparing for Tomorrow's World.* This series is comprised of twelve separate curriculum modules for use in grades seven through twelve and deals with issues at the interfaces of science, technology, and society. The program is based on the socio-scientific reasoning model (Iozzi 1981, 1987) and focuses on the simultaneous development of mental structures (moral development, cognition, and social role taking), knowledge, and thinking skills.

Several modules in this series deal directly with environmental issues and environmental education. These include *Coastal decisions: Difficult choices; Energy: Decisions for today and tomorrow; People and environmental changes; Environmental dilemmas: Critical decisions; Of animals, nature, and people; Beacon City: An urban land use simulation;* and *Decisions for today and tomorrow: Issues in science, technology and society.*

In addition, the author has recently completed a book to assist teachers in dealing with environmental issues and issues in science, technology and society in the classroom: *Science-Technology-Society: A guide for teachers of science and social studies.* For information on the curriculum modules and the guidebook for teachers, contact Sopris West, Inc., 1120 Delaware Avenue, Longmont, Colo. 80501.

3. Hungerford, H., R. Litherland, R. B. Payton, J. Ramsey, A. Tomera, and T. Volk. 1985. *Investigating and evaluating environmental issues and actions: Skill development modules.* Champaign, Ill.: Stipes Publishing

4. The following resources should be most useful for understanding and for developing questioning skills designed to help children develop higher order thinking skills, attitudes and values:

Beyer, B. K. 1987. *Practical strategies for the teaching of thinking.* Boston: Allyn and Bacon.

Bloom, B. (ed.) 1956. *Taxonomy of educational objectives, handbook I: Cognitive domain.* New York: David McKay Company.

Costa, A. (ed.) 1985. *Developing minds: A resource book for teaching thinking.* Arlington, Va.: Association for Curriculum and Supervision.

Iozzi, L. A. 1987. *Science-technology-society: Preparing for tomorrow's world.* Longmont, Co.: Sopris West.

Krathwohl, D., B. Bloom, B. Masia. 1964. *Taxonomy of educational objectives, handbook II: Affective domain.* New York: David McKay Co.

Marzano, R. (ed.) 1988. *Dimensions of thinking: A framework for curriculum and instruction.* Alexandria, Va.: Association for Supervision and Curriculum Development.

5. The American Forest Foundation is making available a new computer program for junior high school students. This program diskette is available by contacting American Forest Foundation, 1250 Connecticut Avenue NW, Washington, D.C. 20036.

6. The following are excellent sources of environmental education materials/references dealing with the affective domain: for state environmental guides and recommendations, contact state environmental education coordinator/consultant; state education department; state environmental education organizations; and various universities and colleges in your state. Other environmental education materials include *Project Learning Tree*, available from the American Forest Foundation, 1250 Connecticut Avenue NW, Suite 320, Washington, D.C. 20036 (guides for grades K–6 and 7–12, plus *Hannah Habitat —Where Are You*, a computer program). ERIC Clearinghouse for Science, Mathematics, and Environmental Education (Ohio State University, 1200 Chambers Road, Columbus, Ohio 43212) is an extremely valuable source for materials, guides, activities, curricula, and other very useful environmental education documents. A computer-assisted search can be made using key words to guide selection of materials from a vast bank of resources. Contact the ERIC environmental education section for information or access to the resource. Another useful resource available through ERIC is *Values Activities in Environmental Education* by Mary Lynn Bowman.

Other resources include the guide *Programs That Work*, which lists all programs available through the *National Diffusion Network. Programs That Work* is available from Sopris West Inc., 1120 Delaware Ave., Longmont, Colo. 80501. Be sure to review each new edition of this guide, which is published annually, as programs are added and deleted each year.

An excellent source of "science, technology and society" (STS) information that also deals with environmental issues is the Science through Science, Technology, Society Project. Many of the materials include a strong emphasis on the affective domain. This project serves as the national clearinghouse for STS materials. The clearinghouse also publishes an excellent newsletter. (Their address: Pennsylvania State University, 128 Willard Building, University Park, Penna. 16802.)

Other resources include *Project Wild. Supplementary Guide for K–6; Project Wild. Supplementary Guide for 7–12;* and *Project Wild—Aquatic Supplement.* Contact the natural resources department of your state to find out how to get copies of these programs.

Several professional environmental education organizations are as follows: North American Association for Environmental Education (NAEE), P.O. Box 400, Troy, Ohio 45393. This is *the* major environmental education organization in North America. The NAEE provides numerous services and makes available many quality publications to its members. Other outstanding organization for teachers interested in environmental education can be contacted for a listing of member services. These include the National Science Teachers Association, 1742 Connecticut Ave., Washington, D.C. 20009; the National Audubon Society, P.O. Box 51000, Boulder, Colo. 80321-1000; and the National Wildlife Federation, 1412 16th St. N.W., Washington, D.C. 20036. The National Wildlife Federation publishes the outstanding periodical, *NatureScope*, in addition to several other attractive and useful materials.

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Iozzi, L. A. (Forthcoming.) *Teaching about issues in science-technology-society: A handbook for teachers.* Longmont, Colo.: Sopris West.

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Photographs by Terry Deal Reynolds

Courting Controversy: How to Build Interdisciplinary Units

Jackie Williams and Terry Deal Reynolds

When teachers build interdisciplinary thematic units around hot local issues, the result, said one student, is "learn, learn, learn."

As 25 6th graders from a small school in an affluent area of Asheville, North Carolina, stepped off the two new school vans, the rural surroundings looked somewhat foreboding. It was an overcast day, and in the dim light, the plain school building before them appeared shabby and in need of repair. The smell reeking from the Pigeon River across the street augmented the dismal atmosphere. And then there was a daunting sign, "Warning: Dioxin."

The Asheville students entered the small country school, which serves 70 children in grades K-8. The visiting students were amazed to see birds flying freely to their nests in the open hallways.

In the classrooms, the visitors met their hosts. At first, both groups of students were reluctant to mix. They sat awkwardly in pairs and small groups. At the teachers' encouragement, the students began to converse shyly, the guests dutifully asking questions and taking notes on their partners' replies.

To break the ice still further, the principal of the school (who also taught 7th and 8th grades) persuaded a few of his students to perform a rap that they had written about their community's problems. The lively beat and stirring message soon led to animated conversation between the two groups of students.

As the 90-minute visit progressed, the children gradually became engrossed in a variety of activities. Some walked along the river with host students. Others chatted in groups on the floor of the classrooms. Three students were fascinated by scrapbooks in the school library. The task-oriented few taped interviews with teachers.

> By the end of the unit, the students knew more about this local controversy than many of their well-informed parents and teachers.

On the surface, the visit appeared to be a casual exchange between students from different locales. The young people from Asheville, however, actually learned a great deal about life in a rural Tennessee town. They heard how the lifeblood of the community, the Pigeon River, is contaminated by toxic chemicals, often has an unnatural coffee-like color, and always smells like rotten eggs due to the wastewater discharge from a paper mill 50 miles

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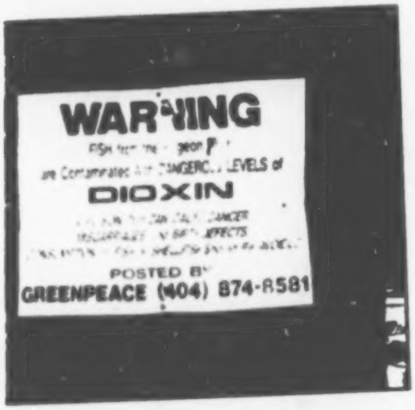
upstream. On discovering that many of the 600 residents suspect that the flood of pollution is implicated in the cancer-related deaths of loved ones, the students sensed the frustration that stems from years of unsuccessful attempts to get people to listen and care and act. Students also began to grasp the difficulty of influencing the large, powerful paper industry.



Back at their home school the next day, the students eagerly began to write about their experiences. They portrayed the individuals they interviewed, describing not only physical attributes, but personalities and attitudes. They accurately depicted the school, community, and lifestyles encountered. They ventured beyond interview transcripts and observations to interject their own thoughts. Their powerful, moving documentaries revealed a genuine understanding of one side of a complex environmental issue involving many different points of view.

But this assignment required more than clear images and candor. Before the trip, the interviewers had been (1) primed to take complete notes, which would later be organized and summarized; (2) instructed to write with great detail and precision, making sure of all the facts used; and (3) urged to use quotations to emphasize certain points or add interest to their stories.

Integrating Several Subjects

This 6th grade trip to rural Tennessee was not an isolated event, but one of the many hands-on experiences in a 12-week interdisciplinary unit. Designed to make each student an expert on paper making, stream pollution, and the controversy whirling around dumping toxic wastes into a previously scenic river, the unit also prompts students to learn and use important concepts in science, social studies, language arts, and mathematics.

Teachers from each of the four subject areas devoted a great deal of time and effort to planning the unit. When implemented, however, it unfolded so beautifully that it surprised even the most optimistic members of the team, prompted further curriculum development, and led a movement to change the entire middle school program to one organized around interdisciplinary thematic units and team teaching.

Throughout the implementation of the unit, the teachers made a point of not differentiating among the subject areas. During the planning phase, though, each of the teachers represented his or her discipline, and each had two clear-cut responsibilities: to make sure that content and skills from each subject were developed during the unit and to provide suggestions as to how this might be done.

In *science*, the unit activities came to center on river pollution, with a special emphasis on wastewater discharge from pulp and paper mills. A state environmental management official spoke to the students about the facts in the Pigeon River pollution and explained the system used to monitor stream pollution. Prior to their trip, the students practiced stream sampling. During the trip, they compared their own data to results from the state regulatory agencies.

Students heard a former paper industry executive talk about paper making, and then they toured a mill. On their return to school, the students tried making paper. After experimenting for nearly a week, exuberant voices rang through the school: "It worked! We *made* paper!"

At the end of the unit, students completed an extensive written exam. The science teacher said that he had never seen such a thorough grasp of complex scientific concepts in a group of 6th graders.

In *social studies*, the students studied the issue of toxic waste dumping. First, they examined files on the subject in the local library. Thereafter, they followed the news for updates. In the process, they began to understand the political, economic, and social implications of a large industry where jobs, livelihoods, and consumer convenience have to be weighed against the environment, health, and the preservation of natural resources.

In perceiving these trade-offs, students learned that there are many sides to an issue. It also became clear that in order to look at a problem objectively, facts must be disentangled from opinions. Another key revelation was that responsible action can only be taken if citizens are informed. For their part, the students became keenly aware and involved. In fact, by the end of the unit, the students knew more about this local controversy than many of their well-informed parents and teachers.

Meanwhile, the *language arts* teachers jumped at every chance to involve the students in authentic communication. Guest speakers, tours, interviews, and presentations provided wonderful occasions to practice the listening and note-taking necessary to prepare oral and written presentations.

Writing assignments included an exposition called "How to Make Paper," interview write-ups, and position papers.

Reading played a key part in the entire process, too. From newspaper articles, notes, and hand-outs, learners

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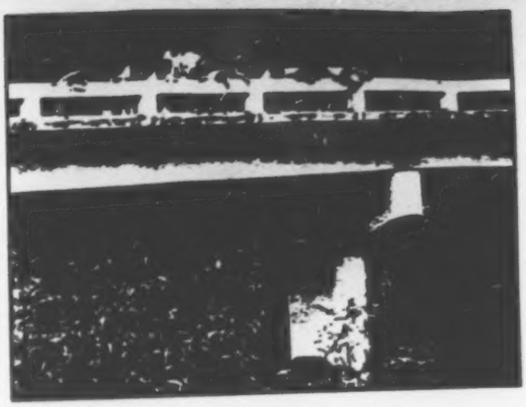
Far Left: A sign posted on Pigeon River near Hartford Elementary School in rural Tennessee.

Middle: A Carolina Day School student learns firsthand about Pigeon River pollution from her new friend at Hartford School.

Right: Sixth graders from Carolina Day School collect stream samples on Pigeon River just below the point of discharge to compare with data from the state regulatory agencies.



developed their own chronology of important events. Weekly vocabulary lists included paper-making terms, such as *lignin*, *tannin*, and *dioxin*.

Speaking opportunities abounded as well. The 6th graders became quite adept at interviewing techniques, and through dramatic portrayals of fictional characters who might have been involved in the controversy, the students stated their own views and responded to others' opinions. Each student also participated in a dialogue as part of the final examination.

Mathematics skills were acquired and applied during the stream-sampling efforts, since collecting and manipulating the data (on, for instance, stream depth, velocity, and temperature) required computation and the application of mathematical formulas. To help plan the overnight field trip to the paper mill and the rural Tennessee school, students were called upon to develop personal budgets. They also had to manage their money and record their expenses during the trip.

Forming Interdisciplinary Teams

One of the best ways to integrate the curriculum is to pull all of the subject-area teachers together to develop thematic units. The team can look first at the characteristics and needs of their learners—academic, social/emotional, and physical—and then design specific units with clear objectives and appropriate activities tailored to meet the identified needs.

Each teacher on the team contributes to the planning and thus develops a sense of ownership for the unit. The team members share the responsibility for setting up special activities, collecting materials, and contacting community resource people.

One giant hurdle that the interdisciplinary team must clear is the temptation to force integration of the curriculum by stringing existing activities together. The inclination is understandable—any veteran educator has accumulated mounds of teaching materials that save time and effort.

All the same, if team members are to focus on a fresh new theme, they must let go of old, comfortable props. Planning all-new activities may prove tedious and time-consuming, but the ultimate rewards make the effort worthwhile.

Choosing a Theme

The success of an interdisciplinary unit depends on a good choice of themes. For several reasons, we have found a controversial local issue makes a good topic. First, it ignites student interest in ways that other studies can't. Students begin to examine the needs of their own community through previously unexplored sources of information and find many ways to become involved and make contributions. Through interviews of local citizens and leaders, students come to see that no problem is as simple or one-sided as it appears and that few problems have perfect or easy solutions.

In addition, local issues present many ways to bring the community into the classroom; such opportunities include guest speakers, demonstrations, and displays of student research results. Finally, community resources are close—often just a phone call away. Parents, especially, often become so enthused that they offer assistance or just find common ground for talking with their child.

The themes for an effective unit must be relevant and thought-provoking, for if the topic is meaningful for others in the school and community, people will want to hear what the students have to say about it—and nothing motivates like a captivated audience.

And, while it is important for each of the subject-area experts to make sure that activities are included from each discipline, learners, too, can influence decisions about themes or activities. The students might brainstorm ideas and discuss them prior to the teaching team's decision, or the process could work in reverse, with the team generating ideas for the students to discuss and choose.

No Problem-Free Units

The development of an interdisciplinary unit is unlikely to be problem-free. The example that we have described was no exception!

Initially, there were some doubts about the value of such a project. Our team also experienced some typical problems: philosophical differences; scheduling conflicts; perceptions that some members were not doing their fair share of the work; and a harried sense of *too-much-to-do-and-nowhere-near-enough-time-to-do-it*.

Nonetheless, all the members of the team are now convinced that the benefits of this powerful learning experience cannot be matched by any departmentalized teaching approach.

Maybe one of the reasons for the teachers' ultimate commitment to the concept is the way students responded. After the two-day field trip, one student reported back to an administrator. "It was great!" she declared. She had only one complaint, "All we did was learn, learn, learn!" ■

Jackie Williams and **Terry Deal Reynolds** recently taught grades 6 and 7 at the Carolina Day School in Asheville, North Carolina. They are now curriculum consultants who promote teaching language arts through hands-on experiences.

Tackling Society's Problems In English Class

Jim Burke

A high school teacher's impromptu unit on "Social Problems" gave his students an opportunity to develop their writing skills while expanding their concept of community.

Every day I drive by homeless people on my way to teach in Castro Valley, a quiet suburb in the East Bay near San Francisco. As many of my students walk to school along the town's serene, picturesque streets, it is difficult for them to imagine the dejected people I see each morning or the ravaged individuals in the hospitals and on the streets who have AIDS. Confronted with this sharp contrast from home to work, I feel obligated to develop in my sophomores an awareness of social problems that they may not otherwise know of or feel concerned about.

So, come spring semester, we embark on a multifaceted project, titled simply "Social Problems."

Identifying the Problems

To begin, I ask students at their desks to generate a list of social problems. Walking around the class, I note that several topics are common to many lists: the Greenhouse Effect, homelessness, pollution. Scanning farther down their lists, I see that several have listed abortion, gun control, the death penalty. I give them a few more minutes to come up with problems that are important or of interest to them.

Next we make a master list of topics on the chalkboard. I put up whatever they say, not yet ready to make the first distinction between problems and issues. By the time Brett calls out exhausted their lists.

I ask Brett how he arrived at gun control as a social problem. "Well, it seems like so many people are getting killed with guns these days," he says. "So are the guns the problem here, or is there something else?" I ask. Andrea points out that the guns are not the problem, but that one problem society faces is a skyrocketing crime rate. "So we might look at the idea of gun control down the line as more of a possible solution to the crime problem in society," I suggest.

Just for fun, we take a minute to see how many people in the class own guns. About 75 percent. Upon further questioning, we learn that four students have used automatic weapons. I move on, thinking that gun control will probably not be a big-ticket item when they come to solutions for the crime problem. After distributing the project assignment, which includes my expectations and the rubric for the project, I give them time to go over it and get an idea of what they are in for.

For the remainder of the quarter—we pursue this project while continuing to study the required literature—I arrange the class into workshops. Because the project requires different types of work, the students need the opportunity to do many tasks while I am available to assist them. Today Sean and Jim are having difficulty locating articles on the diminishing rainforests, and they expect to have interview. The workshop format gives me the chance to accompany them to the English office to research the phone numbers of appropriate agencies.

When Sean and Jim return to the class, their enthusiasm is obvious. They tell me that they talked to "some guy" who wants to send them all sorts of "stuff" on the rainforest. All year, these two students have been passive participants in the class as we have studied literature and tried to learn new writing skills. Suddenly, finding themselves in charge of this project, needing to communicate with "real people" in their community, they are into it and eager to share what they learned with other students who are studying the rainforest.

Searching for Solutions

On workshop days, we begin to form spontaneous groups according to topics, so that students can cull from

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> By writing letters to political representatives, my students realize that, even as young people, they can have a say in matters that affect them and their community.

We pause to confer as a class as needed. In the informal groups I observe fascinating transformations and transactions.

One day, for example, some students want to know whether they can work together to develop one survey that all can use. "What would the advantage of that be?" I ask. "We could get more ideas and organize our efforts to interview more people," they say. Other students have decided to keep their surveys individualized, because they want to focus on different aspects of the problem than the rest of the group.

I begin to regard the momentum of this project with a certain awe: it is my first year teaching, and before my eyes I am watching things I studied and learned come to life.

The librarian is excited by the opportunity to let the students use her facilities and the new binders of articles on many of the topics they are investigating. Once they begin their research, students must submit a series of assignments to me to let me know they are moving ahead and in what directions. I ask them to find at least two articles on their chosen subject—"No, a three-sentence blurb in the *Oakland Tribune* does not constitute an article." I also ask for a summary of their articles, which identifies the three main points that they will stress.

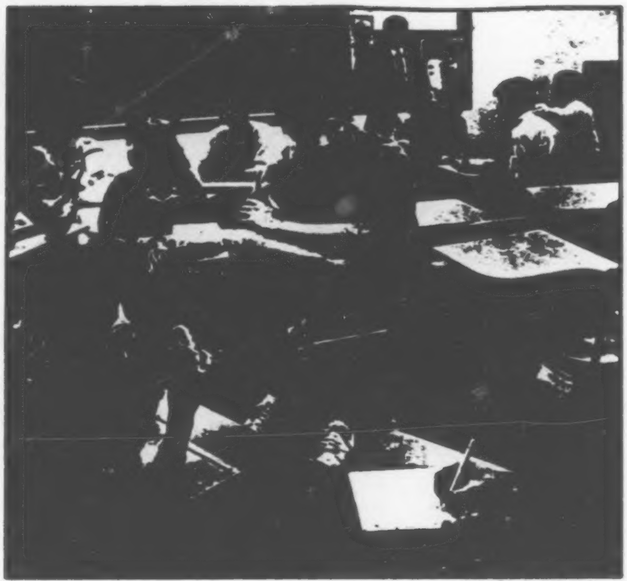
When it's time for students to outline their papers, I do not require any strict format. Instead, we brainstorm the attributes of an effective, thorough paper. I compile their ideas and mine and give the sheet to them as a handout the next day.

For their interviews and surveys, students must follow the same procedure, summarizing their findings and identifying at least three main ideas to pursue. We spend some time on the mechanics of the process, looking at sample interviews and questionnaires, and discussing the appropriate etiquette. During this part of the assignment, students learn to incorporate information from many sources into one paper to support a larger idea, how to interact with people in a variety of situations, and how to conduct serious discussions about important matters.

Observing a Work in Progress

Next the students begin to organize their findings, their interviews, and their own thinking about the subject. After nearly a month, I am hearing no complaints. In addition, I am witnessing fine work by some previously unenthusiastic members of the class. Most—but not all—are ready to get down to some draft writing. So, cooperating with Joanne, the teacher who heads the computer lab, the students begin going to the lab on workshop days to prepare their papers—which must be, as I told them right off, *typed*. Our use of the workshop format continues to provide the needed flexibility to adapt to the changing directions of the project.

As the unit progresses, I begin to detect a different tone and maturity in many of my students. Suddenly they are aware of problems that concern



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them, that are significant, and that they can actually *do* something about. This last revelation is especially important, for the study of large problems can easily lead to feelings of helplessness. However, after plugging into such organizations as Greenpeace, Rainforest Action Network, and local homeless agencies, the students' fears are stemmed. They may not be able to solve these vast problems, but they are learning what can be done to, at least, arrest them. Feelings of civic involvement, of the ability to make a difference, abound.

Their empowerment is further bolstered by the next step in the project. Once they have begun to write their papers, my students feel informed enough to write at least one letter. So I send a group to the library to gather the addresses of local, state, and federal politicians. By writing letters to their choices of these representatives, they see the power of writing in the real world. Even as young people, they realize that they can have a say in matters that affect them and their community.

Meanwhile, their notion of a community is expanding daily. My students are no longer safely hidden away in this bedroom community with only one high school. They are writing to Washington about what is going on in South America, to Sacramento about hunger in Africa, to local politicians about the homeless in the Bay Area. And as their research continues, they are able to propose meaningful solutions, citing reputable and irrefutable sources from magazines, newspapers, and experts.

A young woman who once spent the whole period trying to sneak a look in her pocket mirror and dab her makeup is now telling me that she talked to homeless families over the weekend, while shopping in San Francisco for her prom dress. One or two others tell me that they felt uncomfortable spending money on party clothes after seeing or talking with the homeless. This outcome is not what I want necessarily, but it relates to the objective: developing a social conscience for the world and people around you.

Nearing the Final Stretch

My students are now editing and responding to one another's papers. Because they are all informed on a common topic, they can make educated appraisals of others' work. They see, for instance, how Shannon, one of the top students in the class, approached a particular problem that many of them initially had difficulty with.

The end of the quarter nears. Because our sophomore classes emphasize public speaking, the next tasks my kids face is to present their papers to the class. Very much like a convention of scientists, social scientists, and social workers, the students attentively listen as each person presents his or her findings on an amazing array of topics—from transportation to waste disposal, from the Greenhouse Effect to AIDS. As each student steps down from the front of the class—a place I have stood very little in the last quarter—the class gives thunderous applause.

> As their research continues, they are able to propose meaningful solutions, citing reputable and irrefutable sources from magazines, newspapers, and experts.

It is the last day. I call them up one at a time and check off their papers—nearly every one of them more than 10 typed pages, illustrated with cut-out pictures or personal drawings. One by one, they place their neatly assembled papers onto my desk, smiling with pride at the substantial thud that the weight makes.

When all the projects are turned in, the class sighs in unison. But it is not the sigh of "Thank God, that's done." It is the sigh of satisfaction that comes after hard work. It is the sigh of having done their best work about a problem that they came to care about. It is the sound I hope they will make in future years after they walk out of the ballot box or when they write a politician about an issue important to them. It is a feeling, that sigh, I imagine them experiencing again and again in the future, as they act as members of a larger community than Castro Valley, or even America. ■

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VII

A Prerequisite to the Great Books of Allan Bloom: A Syllabus for Ecological Literacy

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V

Ecological Literacy

Literacy is the ability to read. Numeracy is the ability to count. Ecological literacy, according to Garrett Hardin, is the ability to ask "What then?" Considerable attention is properly being given to our shortcomings in teaching the young to read, count, and compute, but not nearly enough to ecological literacy. Reading, after all, is an ancient skill. And for most of the twentieth century we have been busy adding, subtracting, multiplying, dividing, and now computing. But "What then?" questions have not come easy for us despite all of our formidable advances in other areas. Napoleon did not ask the question, I gather, until he had reached the outskirts of Moscow, by which time no one could give a good answer except "Let's go back home." If Custer asked the question, we have no record of it. His last known words at Little Big Horn were, "Hurrah, boys, now we have them," a stirring if dubious pronouncement. And economists, who are certainly both numerate and numerous, have not asked the question often enough. Asking "What then?" on the west side of the Niemen River, or at Fort Laramie, would have saved a lot of trouble. For the same reason, "What then?" is also an appropriate question to ask before the last rain forests disappear, before the growth economy consumes itself into oblivion, and before we have warmed the planet intolerably.

The failure to develop ecological literacy is a sin of omission and of commission. Not only are we failing to teach the basics about the earth and how it works, but we are in fact teaching a large amount of stuff that is simply wrong. By failing to include ecological perspectives in any number of subjects, students are taught that ecology is unimportant for history, politics, economics, society, and so forth. And through television they learn that the earth is theirs for the taking. The result is a generation of ecological yahoos without a clue why the color of the water in their rivers is related to their food supply, or why storms are becoming more severe as the planet warms. The same persons as adults will create businesses, vote, have families, and above all, consume. If they come to reflect on the discrepancy between the splendor of their private lives in a hotter, more toxic and violent world, as ecological illiterates they will have roughly the same success as one trying to balance a checkbook without knowing arithematic.

FORMATION OF ATTITUDES

To become ecologically literate one must certainly be able to read and, I think, even like to read. Ecological literacy also presumes an ability to use numbers, and the ability to know what is countable and what is not, which is to say the limits of numbers. But these are indoor skills. Ecological literacy also requires the more demanding capacity to observe nature with insight, a merger of landscape and mindscape. "The interior landscape," in Barry Lopez's words, "responds to the character and subtlety of an exterior landscape; the shape of the individual mind is affected by land as it is by genes."[1] The quality of thought is related to the ability to relate to "where on this earth one goes, what one touches, the patterns one observes in nature—the intricate history of one's life in the land, even a life in the city, where wind, the chirp of birds, the line of a falling leaf, are known." The fact that this kind of intimate knowledge of our landscapes is rapidly disappearing can only impoverish our mental landscapes as well. People who do not know the ground on which they stand miss one of the elements of good thinking which is the capacity to distinguish between health and disease in natural systems and their relation to health and disease in human ones.

If literacy is driven by the search for knowledge, ecological literacy is driven by the sense of wonder, the sheer delight in being alive in a beautiful, mysterious, bountiful world. The darkness and disorder that we have brought to that world give ecological literacy an urgency it lacked a century ago. We can now look over the abyss and see the end of it all. Ecological literacy begins in childhood. "To keep alive his inborn sense of wonder," a child, in Rachel Carson's words, "needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in."[2] The sense of wonder is rooted in the emotions or what E. O. Wilson has called "biophilia," which is simply the affinity for the living world.[3] The nourishment of that affinity is the beginning point for the sense of kinship with life, without which literacy of any sort will not help much. This is to say that even a thorough knowledge of the facts of life and of the threats to it will not save us in the absence of the feeling of kinship with life of the sort that cannot entirely be put into words.

There are, I think, several reasons why ecological literacy has been so difficult for Western culture. First, it implies the ability to think broadly, to know something of what is hitched to what. This ability is being lost in an age of specialization. Scientists of the quality of Rachel Carson or Aldo Leopold are rarities who must buck the pressures toward narrowness and also endure a great deal of professional rejection and hostility. By inquiring into the relationship between chlorinated hydrocarbon pesticides and bird populations, Rachel Carson was asking an ecolate question. Many others failed to ask, not because they did not like birds, but because they had not, for whatever reasons, thought beyond the conventional categories. To do so would have required that they relate their food system to the decline in the number of birds in their neighborhood. This means that they would have had some direct knowledge of farms and farming practices, as well as a comprehension of ornithology. To think in ecolate fashion presumes a breadth of experience with healthy natural systems, both of which are increasingly rare. It also presumes that the persons be willing and able to "think at right angles" to their particular specializations, as Leopold put it.

Ecological literacy is difficult, second, because we have come to believe that education is solely an indoor activity. A good part of it, of necessity, must be, but there is a price. William Morton Wheeler once compared the naturalist with the professional biologist in these words: "[The naturalist] is primarily an observer and fond of outdoor life, a collector, a classifier, a describer, deeply impressed by the overwhelming intricacy of natural phenomena and revelling in their very complexity." The biologist, on the other hand, "is oriented toward and dominated by ideas, and rather terrified or oppressed by the intricate hurly-burly of concrete, sensuous reality.... he is a denizen of the laboratory. His besetting sin is oversimplification and the tendency to undue isolation of the organisms he studies from their natural environment."[4] Since Wheeler wrote, ecology has become increasingly specialized and, one suspects, remote from its subject matter. Ecology, like most learning worthy of the effort, is an applied subject. Its goal is not just a comprehension of how the world works, but, in the light of that knowledge, a life lived accordingly. The same is true of theology, sociology, political science, and most other subjects that grace the conventional curriculum.

The decline in the capacity for aesthetic appreciation is a third factor working against ecological literacy. We have become comfortable with all kinds of ugliness and seem incapable of effective protest against its purveyors: urban developers, businessmen, government officials, television executives, timber and mining companies, utilities, and advertisers. Rene Dubos once stated that our greatest disservice to our children was to give them the belief that ugliness was somehow normal. But disordered landscapes are not just an aesthetic problem. Ugliness signifies a more fundamental disharmony between people and between people and the land. Ugliness is, I think, the surest sign of disease, or what is now being called "unsustainability." Show me the hamburger stands, neon ticky-tacky strips leading toward every city in America, and the shopping malls, and I'll show you devastated rain forests, a decaying countryside, a politically dependent population, and toxic waste dumps. It is all of a fabric.

And this is the heart of the matter. To see things in their wholeness is politically threatening. To understand that our manner of living, so comfortable for some, is linked to cancer rates in migrant laborers in California, the disappearance of tropical rain forests, fifty thousand toxic dumps across the U.S.A., and the depletion of the ozone layer is to see the need for a change in our way of life. To see things whole is to see both the wounds we have inflicted on the natural world in the name of mastery and those we have inflicted on ourselves and on our children for no good reason, whatever our stated intentions. Real ecological literacy is radicalizing in that it forces us to reckon with the roots of our ailments, not just with their symptoms. For this reason, I think it leads to a revitalization and broadening of the concept of citizenship to include membership in a planetwide community of humans and living things.

And how does this striving for community come into being? I doubt that there is a single path, but there are certain common elements. First, in the lives of most if not all people who define themselves as environmentalists, there is experience in the natural world at an early age. Leopold came to know birds and wildlife in the marshes and fields around his home in Burlington, Iowa before his teens. David Brower, as a young boy on long walks over the Berkeley hills, learned to describe the flora to his nearly blind mother. Second, and not surprisingly, there is often an older teacher or mentor as a role model: a grandfather, a neighbor, an older brother, a parent, or teacher. Third, there are seminal books that explain, heighten, and say what we have felt deeply, but not said so well. In my own life, Rene Dubos and Loren Eiseley served this function of helping to bring feelings to articulate consciousness.

Ecological literacy is becoming more difficult, I believe, not

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because there are fewer books about nature, but because there is less opportunity for the direct experience of it. Fewer people grow up on farms or in rural areas where access is easy and where it is easy to learn a degree of competence and self-confidence toward the natural world. Where the ratio between the human-created environment to the purely natural world exceeds some point, the sense of place can only be a sense of habitat. One finds the habitat familiar and/or likeable but without any real sense of belonging in the natural world. A sense of place requires more direct contact with the natural aspects of a place, with soils, landscape, and wildlife. This sense is lost as we move down the continuum toward the totalized urban environment where nature exists in tiny, isolated fragments by permission only. Said differently, this is an argument for more urban parks, summer camps, green belts, wilderness areas, public seashores. If we must live in an increasingly urban world, let's make it one of well-designed compact green cities that include trees, river parks, meandering greenbelts, and urban farms where people can see, touch, and experience nature in a variety of ways. In fact, no other cities will be sustainable in a greenhouse world.

ECOLOGICAL LITERACY AND FORMAL EDUCATION

The goal of ecological literacy as I have described it has striking implications for that part of education that must occur in classrooms, libraries, and laboratories. To the extent that most educators have noticed the environment, they have regarded it as a set of problems which are: (1) solvable (unlike dilemmas, which are not) by (2) the analytic tools and methods of reductionist science which (3) create value-neutral, technological remedies that will not create even worse side effects. Solutions, therefore, originate at the top of society, from governments and corporations, and are passed down to a passive citizenry in the form of laws, policies, and technologies. The results, it is assumed, will be socially, ethically, politically, and humanly desirable, and the will to live and to sustain a humane culture can be preserved in a technocratic society. In other words, business can go on as usual. Since there is no particular need for an ecologically literate and ecologically competent public, environmental education is most often regarded as an extra in the curriculum, not as a core requirement or as an aspect pervading the entire educational process.

Clearly, some parts of the crisis can be accurately described as problems. Some of these can be solved by technology, particularly those that require increased resource efficiency. It is a mistake, however, to think that all we need is better technology, not an ecologically literate and caring public willing to help reduce the scale of problems by reducing its demands on the environment and to accept (even demand) public policies that require sacrifices. It all comes down to whether the public understands the relation between its well-being and the health of the natural systems.

For this to occur, we must rethink both the substance and the process of education at all levels. What does it mean to educate people to live sustainably, going, in Aldo Leopold's words, from "conqueror of the land community to plain member and citizen of it"?[5] However it is applied in practice, the answer will rest on six foundations.

The first is the recognition that *all education is environmental education*. By what is included or excluded, emphasized or ignored, students learn that they are a part of or apart from the natural world. Through all education we inculcate the ideas of careful stewardship or carelessness. Conventional education, by and large, has been a celebration of all that is human to the exclusion of our dependence on nature. As a result, students frequently resemble what Wendell Berry has called "itinerant professional vandals," persons devoid of any sense of place or stewardship, or inkling of why these are important.[6]

Second, *environmental issues are complex and cannot be understood through a single discipline or department*. Despite a decade or more of discussion and experimentation, interdisciplinary education remains an unfulfilled promise. The failure occurred, I submit, because it was tried within discipline-centric institutions. A more promising approach is to reshape institutions to function as transdisciplinary laboratories that include components such as agriculture, solar technologies, forestry, land management, wildlife, waste cycling, architectural design, and economics.[7] Part of the task, then, of Earth-centered education is the study of interactions across the boundaries of conventional knowledge and experience.

Third, *for inhabitants, education occurs in part as a dialogue with a place and has the characteristics of good conversation*. Formal education happens mostly as a monologue of human interest, desires, and accomplishments that drowns out all other sounds. It is the logical outcome of the belief that we are alone in a dead world of inanimate matter, energy flows, and biogeochemical cycles. But true conversation can occur only if we acknowledge the existence and interests of the other. In conversation, we define ourselves, but in relation to another. The quality of conversation does not rest on the brilliance of one or the other person. It is more like a dance in which the artistry is mutual.

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In good conversation, words represent reality faithfully. And words have power. They can enliven or deaden, elevate or degrade, but they are never neutral, because they affect our perception and ultimately our behavior. The use of words such as "resources," "manage," "channelize," "engineer," and "produce" makes our relation to nature a monologue rather than a conversation. The language of nature includes the sounds of animals, whales, birds, insects, wind, and water—a language more ancient and basic than human speech. Its books are the etchings of life on the face of the land. To hear this language requires patient, disciplined study of the natural world. But it is a language for which we have an affinity.

Good conversation is unhurried. It has its own rhythm and pace. Dialogue with nature cannot be rushed. It will be governed by cycles of day and night, the seasons, the pace of procreation, and by the larger rhythm of evolutionary and geologic time. Human sense of time is increasingly frenetic, driven by clocks, computers, and revolutions in transportation and communication.

Good conversation has form, structure, and purpose. Conversation with nature has the purpose of establishing, in Wendell Berry's words: "What is here? What will nature permit here? What will nature help us do here?"[8] The form and structure of any conversation with the natural world is that of the discipline of ecology as a restorative process and healing art.

Fourth, it follows that *the way education occurs is as important as its content.* Students taught environmental awareness in a setting that does not alter their relationship to basic life-support systems learn that it is sufficient to intellectualize, emote, or posture about such things without having to live differently. Environmental education ought to change the way people live, not just how they talk. This understanding of education is drawn from the writings of John Dewey, Alfred North Whitehead, J. Glenn Gray, Paulo Friere, Ivan Illich, and Eliot Wigginton. Learning in this view best occurs in response to real needs and the life situation of the learner. The radical distinctions typically drawn between teacher and student, between the school and the community, and those between areas of knowledge, are dissolved. Real learning is participatory and experiential, not just didactic. The flow can be two ways between teachers, who best function as facilitators, and students who are expected to be active agents in defining what is learned and how.

Fifth, *experience in the natural world is both an essential part of understanding the environment, and conducive to good thinking.* Experience, properly conceived, trains the intellect to observe the land carefully and to distinguish between health and its opposite. Direct experience is an antidote to indoor, abstract learning. It is also a wellspring of good thinking. Understanding nature demands a disciplined and observant intellect. But nature, in Emerson's words, is also "the vehicle of thought" as a source of language, metaphor, and symbol. Natural diversity may well be the source of much of human creativity and intelligence. If so, the simplification and homogenization of ecosystems can only result in a lowering of human intelligence.

Sixth, *education relevant to the challenge of building a sustainable society will enhance the learner's competence with natural systems.* For reasons once explained by Whitehead and Dewey, practical competence is an indispensable source of good thinking. Good thinking proceeds from the friction between reflective thought and real problems. Aside from its effects on thinking, practical competence will be essential if sustainability requires, as I think it does, that people must take an active part in rebuilding their homes, businesses, neighborhoods, communities, and towns. Shortening supply lines for food, energy, water, and materials—while recycling waste locally—implies a high degree of competence not necessary in a society dependent on central vendors and experts.

THE AIM: ECOLOGICAL LITERACY

If these can be taken as the foundations of Earth-centered education, what can be said of its larger purpose? In a phrase, it is that quality of mind that seeks out connections. It is the opposite of the specialization and narrowness characteristic of most education. The ecologically literate person has the knowledge necessary to comprehend interrelatedness, and an attitude of care or stewardship. Such a person would also have the practical competence required to act on the basis of knowledge and feeling. Competence can only be derived from the experience of doing and the mastery of what Alasdair MacIntyre describes as a "practice."[9] Knowing, caring, and practical competence constitute the basis of ecological literacy.

Ecological literacy, further, implies a broad understanding of how people and societies relate to each other and to natural systems, and how they might do so sustainably. It presumes both an awareness of the interrelatedness of life and knowledge of how the world works as a physical system. To ask, let alone answer, "What then?" questions presumes an understanding of concepts such as carrying capacity, overshoot, Liebig's Law of the minimum, thermodynamics, trophic levels, energetics, and succession. Ecological literacy presumes that we under-

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stand our place in the story of evolution. It is to know that our health, well-being, and ultimately our survival depend on working with, not against, natural forces. The basis for ecological literacy, then, is the comprehension of the interrelatedness of life grounded in the study of natural history, ecology, and thermodynamics. It is to understand that: "There ain't no such thing as a free lunch"; "You can never throw anything away"; and "The first law of intelligent tinkering is to keep all of the pieces." It is also to understand, with Leopold, that we live in a world of wounds senselessly inflicted on nature and on ourselves.

A second stage in ecological literacy is to know something of the speed of the crisis that is upon us. It is to know magnitudes, rates, and trends of population growth, species extinction, soil loss, deforestation, desertification, climate change, ozone depletion, resource exhaustion, air and water pollution, toxic and radioactive contamination, resource and energy use—in short, the vital signs of the planet and its ecosystems. Becoming ecologically literate is to understand the human enterprise for what it is: a sudden eruption in the enormity of evolutionary time.

Ecological literacy requires a comprehension of the dynamics of the modern world. The best starting place is to read the original rationale for the domination of nature found in the writings of Bacon, Descartes, and Galileo. Here one finds the justification for the union of science with power and the case for separating ourselves from nature in order to control it more fully. To comprehend the idea of controlling nature, one must fathom the sources of the urge to power and the paradox of rational means harnessed to insane ends portrayed in Marlowe's *Doctor Faustus*, Mary Shelley's *Frankenstein*, Melville's *Moby-Dick*, and Dostoevsky's "Legend of the Grand Inquisitor."

Ecological literacy, then, requires a thorough understanding of the ways in which people and whole societies have become destructive. The ecologically literate person will appreciate something of how social structures, religion, science, politics, technology, patriarchy, culture, agriculture, and human cussedness combine as causes of our predicament.

The diagnosis of the causes of our plight is only half of the issue. But before we can address solutions there are several issues that demand clarification. "Nature," for example, is variously portrayed as "red in tooth and claw," or, like the film "Bambi," full of sweet little critters. Economists see nature as natural resources to be used; the backpacker as a wellspring of transcendent values. We are no longer clear about our own nature, whether we are made in the image of God, or are merely a machine or computer, or animal. These are not trivial, academic issues. Unless we can make reasonable distinctions between what is natural and what is not, and why that difference is important, we are liable to be at the mercy of the engineers who want to remake all of nature, including our own.

Environmental literacy also requires a broad familiarity with the development of ecological consciousness. The best history of the concept of ecology is Donald Worster's *Nature's Economy*.[10] It is unclear whether the science of ecology will be "the last of the old sciences, or the first of the new." As the former, ecology is the science of efficient resource management. As the first of the new sciences, ecology is the basis for a broader search for pattern and meaning. As such it cannot avoid issues of values, and the ethical questions raised most succinctly in Leopold's "The Land Ethic."

The study of environmental problems is an exercise in despair unless it is regarded as only a preface to the study, design, and implementation of solutions. The concept of sustainability implies a radical change in the institutions and patterns that we have come to accept as normal. It begins with ecology as the basis for the redesign of technology, cities, farms, and educational institutions, and with a change in metaphors from mechanical to organic, industrial to biological. As part of the change we will need alternative measures of well-being such as those proposed by Amory Lovins (least-cost end-use analysis),[11] H. T. Odum (energy accounting),[12] and John Cobb (index of sustainable welfare).[13] Sustainability also implies a different approach to technology, one that gives greater priority to those that are smaller in scale, less environmentally destructive, and rely on the free services of natural systems. Not infrequently, technologies with these characteristics are also highly cost-effective, especially when subsidies for competing technologies are leveled out.

If sustainability represents a minority tradition, it is nonetheless a long one dating back at least to Jefferson. Students should not be considered ecologically literate until they have read Thoreau, Kropotkin, Muir, Albert Howard, Alfred North Whitehead, Gandhi, Schweitzer, Aldo Leopold, Lewis Mumford, Rachel Carson, E. F. Schumacher, and Wendell Berry. There are alternatives to the present patterns that have remained dormant or isolated, not because they did not work, were poorly thought out, or were impractical, but because they were not tried. In contrast to the directions of modern society, this tradition emphasizes democratic participation, the extension of ethical obligations to the land community, careful ecological design, simplicity, widespread competence with natural systems, the sense of place, holism, decentralization of whatever can best be decentralized, and human-scaled technologies and communities. It is a tradition dedicated to the search for patterns, unity, connections between people of all ages, races, nationalities, and generations, and between people and the natural world. This is a tradition grounded in the belief that life is sacred and not to be carelessly expended on the ephemeral. It is a tradition that challenges militarism, injustice, ecological destruction, and authoritarianism, while supporting all of those actions that lead to real peace, fairness, sustainability, and people's right to participate in those decisions that affect their lives. Ultimately, it is a tradition built on a view of ourselves as finite and fallible creatures living in a world limited by natural laws. The contrasting Promethean view, given force by the success of technology, holds that we should remove all limits, whether imposed by nature, human nature, or morality. Its slogan is found emblazoned on the advertisements of the age: "You can have it all" (Michelob Beer), or "Your world should know no limits" (Merrill Lynch). The ecologically literate citizen will recognize these immediately for what they are: the stuff of epitaphs. Ecological literacy leads in other, and more durable, directions toward prudence, stewardship, and the celebration of the Creation.

Environmental Education Techniques

ONE OF THE MOST IMPORTANT COMPONENTS OF EE is to help students critically analyze complex environmental issues. Clarifying values, understanding different points of view, and working cooperatively and creatively in considering solutions are all aspects of EE.

In this section, the first four articles discuss educational methods and theories that will improve how students learn about and understand environmental issues. This includes critical thinking skills, handling controversy, clarifying values and processing information. The articles in the second half of this section cover how teachers might approach teaching action strategies and evaluating their program.

Knapp, Clifford E. "A Curriculum Model for Environmental Values Education," *Journal of Environmental Education* 14:3, Spring 1983, pp. 22–26.

While values education is an integral component of environmental education, it presents unique challenges to educators. In this article, Knapp discusses the utility of teaching valuing skills and covers several common approaches to values education. Knapp makes distinctions between "value-fair and value-biased practices" and "imposed versus exposed values."

Comnes, Leslie; and Carolie Sly. "Teaching About Controversial Issues," adapted from "Toxics: Taking Charge," a supplemental unit to *The California State Environmental Guide*, 1991. Reprinted with permission from the Alameda County Office of Education.

Environmental issues are controversial; thus, handling controversy is a valuable skill for environmental educators and trainers. This article provides a brief but helpful list of instructional strategies designed to "minimize polarization of viewpoints and maximize quantity and quality of ideas."

Costa, Arthur L., and Robert Marzano. "Teaching the Language of Thinking," *Educational Leadership* 45:2, October 1987, pp. 29–33.

Critical thinking is necessary to understand complex environmental issues. Costa describes how language can be used as a tool to enhance cognitive processes. He identifies several strategies that teachers and teacher educators can use to facilitate deeper thinking and better discussions. Starting points include "posing critical questions," "giving data, not solutions," and "probing for specificity."

Kaplan, Stephen and Rachel Kaplan. *Cognition and Environment: Functioning in an Uncertain World*, Ann Arbor, MI: Ulrich's Bookstore, 1981, Chapter 8, "The Transfer of Information."

Transferring knowledge is not as easy as simply "giving" information. From an information processing perspective, Kaplan and Kaplan examine the kind of information that people are eager to receive, as well as the kind of information that people tend to ignore or avoid. The authors explain that educators can share knowledge so that students will have a model of interconnected concepts as opposed to a "model of interconnected words." The authors also touch on the unique features of teaching about environmental issues. For example, that people have difficulty in comprehending the consequences of environmental problems, events that are distant in time and space present unique challenges to educators.

Bardwell, Lisa. "Success Stories: Imagery by Example," *Journal of Environmental Education* 23:1, Fall 1991, pp. 5–10.

The enormity of environmental problems often overwhelms those interested in working toward solutions. This article suggests that stories of successful interventions can provide positive imagery, enabling people to feel competent and compelled to act. Stories can help people build models of positive action that they can adapt to their situations. This is an important and often-omitted first step in the action-taking phase of environmental problem solving.

Monroe, Martha C. "Converting 'It's No Use' Into 'Hey, There's a Lot I Can Do': A Matrix for Environmental Action Taking," Deborah A. Simmons, Clifford Knapp, and Charlotte Young (eds.) *Setting the EE Agenda for the 90s: 1990 Conference Proceedings*. Troy, OH: North American Association for Environmental Education, November 1990.

Environmental educators are realizing that dwelling solely on environmental problems leaves students discouraged and overwhelmed. To counteract this, course content has recently included more success stories and case studies describing people's positive actions. Monroe suggests that we can take this a step further. We can actively assist students in developing a mental map of the types of environmental actions that can and are being done on many levels. To assist this process, Monroe has created a matrix of ways "motivators" prompt "problem solvers" to work toward solving environmental problems.

Stapp, William B. and Arjen Wals. *Setting the EE Agenda for the 90's: 1990 Conference Proceedings* (Lisa Bardwell, Martha C. Monroe and Margaret Tudor, (eds.) "*An Action Research Approach to Environmental Problem-Solving,*" Troy, OH: North American Association for Environmental Education, 1994.

Action Research: Community Problem-Solving (AR:CPS) is an example of a comprehensive approach to teaching EE. At the heart of the curriculum is student involvement in real-world issues. For the student, AR:CPS bridges the gap between school and community experience. This article covers the historical roots of both action research and community problem-solving as well as basic steps toward implementing this approach in the classroom.

Bennett, Dean B. "Four Steps to Evaluating Environmental Education Learning Experiences," *Journal of Environmental Education* 20:2, Winter 1988, pp. 14–21.

Program evaluation is often a dreaded and avoided chore. Bennett, however, stresses its positive value in improving EE programs and workshops. In this article, he presents four steps to help educators become better evaluators: (1) set expectations, (2) plan the evaluation, (3) determine results, and (4) use the results to improve programs.

A Curriculum Model For Environmental Values Education

CLIFFORD E. KNAPP

> *I know of no safe depository of the ultimate powers of the society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion.*
>
> Thomas Jefferson
> September 29, 1820

Thomas Jefferson knew more than 160 years ago that citizens must be informed before they can exercise good judgment on decisions facing them. This is especially true in the area of environmental issues and problems. In a recent book review of Lester Brown's *Building A Sustainable Society*, his position on the importance of values is quoted:

> *Values . . . are central to the evolution of a sustainable society, "not only because they influence behavior but also because they determine a society's priorities and thus its ability to survive."* (9:216)

In this article, the term "value" is defined as a standard that guides and determines personal behavior. "Values education," refers to a planned or unplanned school program directed toward or resulting in the development of a personal value system and an associated set of behaviors. Values are first examined in the context of general education and then more specifically as they relate to environmental education. A values model is proposed which is designed to aid environmental educators in the planning and conducting of a value-based curriculum for survival on earth.

Background on Moral Education

The answer to the question, "Should educational institutions be involved in values and moral education?", has been answered affirmatively according to evidence provided by many values-related textbooks, articles, and other instructional materials, teacher education instructional units and courses, statements of school philosophy, aims, and goals, and in public opinions polls. For example, the *1981 Gallup Poll of the Public's Attitudes Toward the Public Schools* (3:36) revealed that among six educational objectives listed, the one that received the highest vote from respondents was "developing students' moral and ethical character." The same poll showed that "Americans would favor instruction in values and ethical behavior as part of the public school curriculum by a ratio of about four to one, 70 percent to 17 percent" (3:37). However, this poll did not reveal the public's interpretations of the terms "moral" and "ethical." Neither did it define what the public views as the specific virtues and behaviors constituting moral character.

Throughout recorded history, educators have viewed values education as a worthy endeavor. Early philosopher and educator Rousseau " . . . assumed that

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the first task of the tutor or teacher is to enable each child to find a sensible answer to the question, 'What will this be good for?' about everything taught" (2:39–40). Another way to express the importance of values education is offered by Louis Raths: "The function of information is to inform. To inform what? To inform your values" (4:1).

Several unanswered questions still remain to be clarified: "What is the purpose of values education?," "What are the best approaches or components of the approaches to values education?," and "How do educators decide upon moral purposes and select these approaches?" This article begins the exploration of these questions.

Values Education Approaches

In order to influence individual value systems through formal educational institutions, a number of approaches to values education have been devised. Although this list of approaches is not all-inclusive, the following represent some important ways in which educators have dealt with values education.

Inculcation

Values have primarily been imposed upon learners using an inculcation approach. Inculcation is a process in which students are asked to accept particular values by reasons of authority and tradition. Inculcation methods include imposing rules and procedures, using examples of moral behavior in past or present practice, or modeling or demonstrating desirable behaviors. Sometimes these imposed values have been taught without awareness by teachers in the "hidden curriculum" and the inculcation was done randomly and with little thought. Albert Schweitzer favored the modeling approach when he was asked how to teach. "His reply was that one needed to do three things to be an effective teacher. First, set an example. Second, set an example. And, finally, set an example" (6:256). The modeling approach, although sometimes effective, has limitations in that human models have varied widely and some models demonstrate a set of inconsistent values. It is inevitable that various inculcation approaches will be used in teaching. There is no educational approach that is value free and therefore certain standards are imposed. The term "inculcation" as used in the article is not proported to be necessarily negative. The effectiveness of the inculcation approaches and the extent to which they should be employed have been questioned by many educators. Beauchamp contended that confusion and controversy exist in moral education when he stated: "Most, in fact, concede that curriculum planners and other educators have failed to deal with the subject of values adequately for modern schooling" (1:168). During the last twenty years, educators have made some serious attempts to remedy this state of affairs. A variety of alternate approaches has been proposed (10). Some of these approaches, for which instructional materials are available, include values clarification, cognitive moral development, value analysis, and action learning. Although all of these approaches are based upon some common assumptions and employ some similar instructional methods, they differ in several significant ways. Briefly, these approaches have the following distinctive characteristics.

Values Clarification

This approach focuses mainly upon the process of valuing, more so than upon the specific content of the values. It aims to help students become aware of personal values in which they have relatively free choice. It mostly uses teacher-structured, written, and discussion exercises designed to

1. examine what students prize
2. encourage public affirmation when appropriate
3. explore some alternative and associated consequences
4. encourage acting thoughtfully on values repeatedly over time

Several hundred exercises have been developed that allow students to clarify values issues related to their present and future lives (7). The values issues have ranged frcm matters of personal choices, largely affecting the individual, to more complex choices involving moral questions. This approach has been subject to more misunderstanding and controversy than the others.

Cognitive Moral Development

This approach is built upon the identification of a universal and sequential stage development of values and is designed to lead students to progressively more complex and higher levels of moral reasoning. The principal instructional technique involves the development and discussion of moral dilemma stories which present conflicts of moral values such as fairness, justice, equality, and human dignity. Students are also asked to examine the reasons for their choice of various value positions. Recent experiments in this aproach have investigated "just" communities in schools. These classroom groups develop their own decision-making procedures designed to operate on a participatory democracy basis.

Value Analysis

Developed largely by social science educators, this approach focuses upon analytical and logical thinking and rational, deductive methods to investigate social values issues. Relevant facts are used as a basis for determining what is a worthy value judgment and action. Operations such as stating the issue, substantiating the relevance of statements, applying related cases to refine value positions, examining the logic of arguments, and gathering and testing evidence are involved in the process.

Action Learning

This approach emphasizes out-of-classroom and community-based learning. It provides opportunities for individuals and groups to act on personal values in the context of real issues and problems. The approach recognizes that self-actualization is affected by social factors and, therefore, the best test for a value relates to how it functions in society. The skills of group dynamics, interpersonal communication, and problem solving are important in implementing action learning.

All of these stated approaches (inculcation, values clarification, cognitive moral development, value analysis, and action learning) can and should be integrated into a curriculum model. The strengths of each approach can be combined to produce an effective and coordinated values education program. Termed by Ryan (8:31) "A Synthesis Approach," this composite model can be applied to many subject matter areas and societal issues and problems.

Need For a Synthesis Model in Values Education

Although some of these "newer" approaches to values education are available to teachers and supporting curriculum materials have been published, they have not been used thoughtfully in many teacher education institutions and in public and private schools. Undoubtedly, the reasons for this are inherent in both the approaches themselves and the characteristics of the educators. The values clarification approach has been used more widely than the others because of the apparently straightforward, concise activities readily available from books, articles, and workshops. Despite the difficulties in implementing these alternate approaches, the traditional approach of inculcation must be supplemented and the total values curriculum redesigned in a more exacting manner.

Because of the complexity of the topic of values education, no approach is problem free. It appears that a number of problems have existed in the ways that schools have knowingly or unknowingly taught values.

The sole use of traditional approaches to values education in the schools has been challenged. Students are exposed daily to other outside (nonformal) social factors such as politics, economics, and cultural heritage through various personal contacts and the media. These "values lessons" are sometimes counter to certain values taught in schools. For example, some segments of society view the natural environment as something to be managed and subdued, rather than to be left undisturbed in places. The organization and philosophy of most public and private schools are authoritarian based, therefore students rarely observe or are involved in models of participatory democracy. If values are formed, in part, through opportunities for choices, examination of alternatives and consequences, and rational decision making, most schools have not provided an ideal setting for values education. Some teachers and administrators tend to demonstrate black and white thinking, dogmatic modes of operating, and a tendency toward adhering to tradition and authority. Teachers are often unclear about their dual roles as educators and private citizens. They often do not see a distinction between conducting a reasoned inquiry into a values issue such as the killing of harp seals and taking an environmental activist position in demonstrating against nuclear energy. The former posture is a "value-fair" educational practice, while the latter is a "value-biased" educational practice. A balance between "value-fair" and "value-biased" practices and the ability to determine which is appropriate must be sought in the curriculum. In some communities a teacher's freedom to deal with controversial issues is limited. A "don't rock the boat" message is conveyed to some teachers by parents and administrators. They sometimes wish to explore personal and social values issues in greater depth than they are permitted. Some teachers are not clear on their own values or the objectives of values education in the community and find dealing with the topic difficult. These and other problems related to values education demand careful analysis and restructuring of the values component of the curriculum.

Developing An Environmental Values Curriculum

The aim of environmental values education is to develop individual value systems related to the interaction between people and natural systems and processes. The application of these value systems to environmental issues leads to societal decisions that purify, improve, and maintain components of natural and built ecosystems. Some objectives of environmental values education are to teach students to:

1. Evaluate certain actions taken related to the environment as either desirable or undesirable
2. Make the most rational decisions in resolving and alleviating environmental issues and problems
3. Function as members of a group in reaching a consensus on moral environmental behavior and practice

An initial step in developing the curriculum is to select the environmental issues and problems to be studied. One example is, "What are the energy alternatives most compatible with environmental quality?" It is important to then distinguish between content and process values involved in investigating this topic. Content values relate to the concepts to be examined, e.g., "Reducing the amount of electricity consumed is 'good.' " Process values relate to how the investigation is implemented, e.g., "Simulations are 'good' methods to use in examining energy issues."

Ideally, decisions regarding any curriculum should involve parents, administrators, and teachers whenever possible and practical. Selecting lists of content and process values is an important first step in the development of the curriculum. Next, each content and process value is divided into two categories—those that will be *imposed upon* and those *exposed to* the students. Imposed values are those inculcated values in which students have very little choice-making opportunity. Most of the imposed values are formally embodied in the curriculum guide, school behavior codes, and informally in the preferences of the parents, teachers, and administrators. One example of an imposed content value is "Ecology concepts are 'good' guides for deciding on solutions to environmental problems." Exposed values are those which students experience but are relatively free to accept or reject. An example of an exposed content value is "Recycling glass containers is a 'good' practice." However, if a teacher gave the student an assignment to recycle glass containers for one month at home, the value would become an imposed content value.

The process of decision making about imposed and exposed content and process values can be time consuming and quite complex with some environmental issues. Some of the decision making should include the students. The degree of student involvement is determined by the ability levels of the teacher and students, the complexity of the environmental issue or problem, and the type of community in which the school is located.

After the lists of values are constructed for each topic, they should be examined for internal consistency and prioritized—those values deemed most worthy should be listed in order. The lists of values should not be too lengthy for each issue or problem examined because of the difficulty in prioritizing them. Prioritizing values will be helpful when conflicts among important values occur.

If the teacher is familiar with the alternative approaches to values education described in this article, aspects of each environmental issue may be taught using skills derived from one or more of them. Integrating aspects of all of the approaches into a meaningful curriculm involves a thorough understanding of each and the available instructional materials. Each approach has both strengths and limitations. Curriculum decision makers must evaluate these and design a program which capitalizes on the strengths of each and avoids as many limitations as possible. As educational research in values education continues, clear evaluative patterns may emerge. Hopefully, the strengths and limitations of each approach will become apparent. Educators must also consider the ease with which each approach can be introduced to teachers and, in turn, translated to students and parents.

> **"If values are formed, in part, through opportunities for choices, examination of alternatives and consequences, and rational decision making, most schools have not provided an ideal setting for values education."**

The aims and objectives of each environmental education unit should be defined in terms of valuing skills. The principal aim of this environmental values model is to provide students with opportunities to apply valuing skills to issues and problems and in the process define, clarify, and develop a personal value system leading to more moral environmental behaviors.

Krathwohl and others have developed a taxonomy to define a theoretical progression of values formation in the affective domain. Knapp (5:39-42) has adapted an environmental problem (littering) to this taxonomy. Krathwohl's model suggests that a value is developed through a series of progressive steps:

1. Receiving (including awareness, willingness to receive, and controlled or selected attention)
2. Responding (including acquiescence in responding, willingness to respond, and satisfaction in response)
3. Valuing (including acceptance of a value, preference for a value, and commitment and conviction)
4. Organization (including conceptualization of a value and organization of a value system)

Theoretically, at the highest level of value development (organization), a person's values are consistent with one another, internalized, and determine individual behaviors. According to Krathwohl, formal education rarely achieves this level of valuing. Nevertheless, educators should still set this goal as the end in view for investigating environmental values.

The following list of valuing skills is suggested as a guide to values curriculum development. The curriculum designer should plan evaluation strategies for each skill. These skills suggest some components of a process directed toward developing a value system which leads to behaviors that lead to human survival and a quality life on a global basis.

Valuing Skills

1. Defining terms and analyzing words and phrases for emotional and/or judgmental impact
2. Examining standards or criteria for establishing what is right or good and analyzing their sources
3. Empathizing with others holding differing value positions represented in a conflict
4. Predicting the balance between "good" consequences and "undesirable" consequences resulting from various alternatives proposed to solve value conflicts
5. Identifying and applying moral principles to specific environmental problems and issues to evaluate how they relate
6. Examining and evaluating lifestyle patterns and associated value systems in ourselves and others
7. Finding relevant and accurate facts related to environmental issues and assessing whether or not they support or negate particular actions
8. Examining value indicators such as personal attitudes, beliefs, ideals, interests, and feelings in relation to personal actions
9. Examining and evaluating the accomplishments of significant human models (i.e., Rachel Carson, John Muir, Theodore Roosevelt, etc.)
10. Examining issues of authority and group consensus methods of arriving at moral principles and behavior
11. Listing and prioritizing standards for making decisions and examining conflicts among them
12. Identifying broad and basic moral principles to serve as a foundation for establishing rules or codes of behavior
13. Identifying value conflicts in everyday life situations
14. Listing reasons for making specific moral choices and listening to the reasons listed by others

Summary

This article provides a brief background of the status and role of values education in American education. It describes some educational approaches to values by highlighting some of the distinctive characteristics of each. A synthesis approach is suggested which capitalizes on the most valuable aspects of each and incorporates the use of valuing skills. The role of the teacher and other segments of the school and community in the implementation of values education is briefly examined. Some suggestions are provided for developing an environmental values curriculum. The model emphasizes using valuing skills as a basis for developing and guiding environmental content selection. Fourteen valuing skills are listed which can be used to build a curriculum which incorporates a wide range of issues and problems.

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VOLUNTEER INTERPRETIVE PROGRAM

The Mt. Hood National Forest, located in the northeast corner of the state of Oregon, has many exciting volunteer opportunities for 1983. Full-time positions include interpretive naturalists, wilderness guards, trail crew members, and forestry aids. Part-time positions and weekend project activities are also available.

In addition to valuable job experience, participants receive free housing, uniform/name tag, on-the-job transportation, and in most instances a food stipend. For more information, contact the District Volunteer Coordinator:

Zigzag Ranger District
70220 E Highway 26
Zigzag, OR 97049
(503) 224-5243

Columbia Gorge Range District
31520 SE Woodward Rd.
Troutdale, OR 97060
(503) 695-2276

Are you unsure how to handle controversial issues? You are not alone! The guidelines presented here, although developed with toxics issues in mind, provide excellent educational strategies to use with wildlife issues. Recommended for grades four and above.

Teaching About Controversial Issues

Adapted from Toxics: Taking Charge, a supplemental unit to The California State Environmental Guide, by Leslie Comnes and Carolie Sly. Reprinted with permission from the Alameda County Office of Education.

Many teachers steer clear of controversy in the classroom and do not discuss environmental issues, which sometimes are controversial, with their students. Yet controversy can provide opportunities for increasing the quality of students' thinking and students' ability to solve problems.

Although controversy is often uncomfortable, it also tends to be intellectually stimulating. As long as students clearly understand that controversial issues are controversial precisely because they are too complex to have clear-cut "right" and "wrong" solutions, they can focus on the process of clarifying their own viewpoints through debate and reflection.

Jean Piaget, Lawrence Kohlberg, and other learning theorists address the importance of cognitive disequilibration in intellectual and moral development. Students benefit from opportunities to consider other viewpoints and defend their own. Productive conflict appears to promote the development of cognitive and moral reasoning; it thus has a valid place in a learning environment.

The Role of the Teacher

Teaching about an environmental issue in the classroom may require a shift in your role as teacher. The teacher operates more like a conductor orchestrating opportunities for students to think about complex issues in a safe, supportive atmosphere rather than focusing primarily on teaching information to be learned. Teachers need to allow ideas to develop, understanding to deepen, and judgments to be made and tested.

Teachers can support student learning by encouraging and facilitating discussion, by providing accurate factual information, and by providing sufficient time to study a multifaceted environmental issue.

Instructional Strategies

Activities should emphasize strategies that minimize polarization of viewpoints and maximize quantity and quality of ideas. Through frequent class discussions and cooperative learning experiences, students should examine their thoughts and opinions without the pressure to come to the "right" conclusion. Emphasis is on the process of sharing opinions, acquiring and judging new information, and making and reflecting on those decisions. The following suggestions support a classroom climate that allows for this kind of thinking and learning:

- Establish clear rules for behavior during class discussions. These rules should first and foremost preserve the integrity of the individual. Personal attacks and name calling should be forbidden, and students should be reminded that any conflicts that arise must be conflicts of ideas, not people; conflicts of ideas can be positive ways of advancing one's thinking. The chart on the following page may be useful for helping students distinguish between constructive and destructive conflict. It might be used to structure opportunities to discuss and practice conflict resolution skills.

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POSITIVE AND NEGATIVE OUTCOMES OF CONFLICT

Conflict is Constructive When It:	*Conflict is Destructive When It:*
Opens up issues of importance, resulting in their activities and clarification.	Diverts energy from more important issues.
Results in solving problems.	Destroys the morale of people or reinforces poor self-concepts.
Increases participation of individuals in issues of importance to them.	Polarizes groups, increasing internal cohesiveness while reducing group cooperation.
Serves as a release for pent-up emotions, anxiety, and stress.	Deepens differences in values.
Helps build cohesiveness among people by making them share the conflict, celebrate its settlement, and learn more about each other through it.	Produces irresponsible and regrettable behavior, such as name calling and fighting.
Helps individuals mature and apply what they've learned to future situations.	Increases stress.

Chart from Hart, L.B., "Test Your Ability to Handle Conflict," *Association Management*, 1983

- Pay attention and respond to feelings underlying expressed ideas. Sometimes students are afraid to voice personal beliefs and convictions; they need to be reassured that this is okay.

- When a conflict arises, observe the group, describe what you observe, and provide time for students to describe what they observe and feel. Engage students in conflict resolution techniques such as reversing roles in argument or negotiating a win-win resolution (so that everyone wins in some way). Provide support for students who are anxious throughout the conflict; many people are uncomfortable with disagreement.

- Use questioning strategies to clarify and advance students' thinking. Ask students to restate an idea in another way, to elaborate, or to reiterate what they hear in order to confirm or clarify. Questions can also be used to advance thinking. Ask students to apply an idea to a real or hypothetical situation, to consider discrepancies in their thinking, or to reassess their idea in light of new information.

- Take time after each class discussion to analyze the thinking of students and yourself so that you value the evolution of thinking rather than only the views expressed. By identifying individual biases, defense strategies, and styles of argumentation, a group can operate more consciously as it tries to fully understand a controversial issue.

Working with Parents and Administrators

A primary reason many teachers avoid teaching about controversial issues is fear of resistance from parents and administrators. The following suggestions will help you avoid resistance and gain their support.

- Examine community attitudes about environmental issues in local newspapers and listen to public discourse on these problems. This will help you anticipate potential concerns and choose how and when to teach a particular environmental issue.
- Consider the occupations of parents in the community. Will any of them be particularly sensitive to certain environmental issues? If so, think through how to best work with these parents so they do not feel threatened by your unit.
- Determine if any lesson or part of a lesson will raise concern among parents or administrators and modify the lesson accordingly.
- Choose a method to inform administrators, then parents, of your plan and to gather their input. Include examples of lessons. Emphasize that the teacher's role is to facilitate discussion and to help students find out how to think about an issue - not what to think.
- Provide plenty of time for feedback from administrators and parents. Incorporate their ideas in ways that make the lessons more instructionally sound.
- As you teach the lessons, keep parents and administrators informed. Describe for them the students' activities and your observations as students learn about an environmental issue.

After you have taught the lessons, provide administrators with a concise assessment of student learning. Describe ways that you would modify the lessons in the future.

Resources

Educators for Social Responsibility, 23 Garden Street, Cambridge, Mass. 02138. This organization provides literature and in-service workshops that address critical environmental and social issues for educators and parents.

Jones, Robert L., and Arthur Zucker. "Is Science Really Value Free?" The Science Teacher, February 1986. This article provides a rationale for using case studies in the science curriculum to help students evaluate issues.

NSTA Yearbook: Science, Technology, Society. Edited by Rodger Bybee, Washington, D.C.: National Science Teachers Association, 1985. The science, technology, and society theme is explored in depth through articles that present background, rationale, and instructional strategies.

Toxics: Taking Charge is available for $6.50, plus 7% sales tax, from the Alameda County Office of Education, Media Sales, 313 West Winston Ave., Hayward, CA 94544-1198.

Teaching the Language of Thinking

By using specific terminology, posing critical questions, and creating new labels to structure perceptions, teachers can use the language of thinking to enhance cognitive development.

To develop students' thinking skills, the teacher uses precise terminology when discussing a story. "What conclusions can you draw about this story? What do you speculate would have

Teaching and learning are predominantly linguistic phenomena; that is, we accomplish most of our learning through the vehicle of language, the daily exchange of words in classrooms. Therefore, language is a tool that teachers can use to enhance cognitive development. If we are to develop a successful program for teaching thinking, we must also develop a language of cognition.

The Linguistic Nature of Instruction

According to Feuerstein (1980), the teacher's interactive role is crucial in the mediated learning experience of children's cognitive development. In their major review of studies of linguistic interactions in classrooms, Green and Smith (1982) conclude that language is used by teachers to "frame" the presentation of content, the tasks students are to perform, and the norms of acceptable and unacceptable conduct. In other words, teachers communicate to students what to do, when to do it, and how to behave when they do it.

Language also creates classroom culture, which is defined as the set of important understandings that class

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(1980) and Purkey and Smith (1982) have identified such classroom culture variables as "tone of orderliness" and "atmosphere of acceptance" as keys to effective teaching. Burger (1977) asserts that culture actually "lives in language."

Labeling is another fundamental characteristic of language (Condon 1968). When people create a name or a label for something, they also create a reality that previously did not exist for them. Condon uses the example of taking a course in astronomy. Before taking the course, a person will look at a night sky and see only *stars*. After a few weeks of instruction he or she will begin to see *super novae, white dwarfs*, and *galaxies*. Thus, when we create labels, we structure our perceptions. New labels foster new perceptions. As Condon observed, "For better or for worse, when names are learned we see what we had not seen, for we know what to look for" (p. 31).

Given the nature and importance of language, creating a classroom language of cognition necessarily involves redefining terminology and perhaps inventing new terminology for specific situations. We have identified seven starting points.

Precise Vocabulary

Teachers often admonish students to "think hard." They sometimes criticize students for not having the inclination to think: "These kids just go off without thinking."

The term *think* covers a range of thought processes. Students may fail to think because the vocabulary is foreign to them or because they may not know how to perform the specific skill implied. Thus, teachers should use specific cognitive terminology and show students how to perform particular skills. For example, instead of saying, "Let's look at these pictures," say "Let's *compare* these two pictures" (fig. 1), and then demonstrate how to find similarities and differences in them.

As children hear these terms daily and develop the cognitive processes that these labels signify, they will internalize the words and use them as part of their own vocabularies. Teachers can also provide specific instruction in cognitive processes so that students will attach precise, shared meaning to the terms (Beyer 1985). Teaching students what goes on in the head when comparisons are made, what are helpful steps in a decision-making process, and what techniques cause creative juices to flow when writing a story are examples of ways teachers can provide specific instruction in thinking skills.

Instead of saying:	Say:
"Let's look at these two pictures."	"Let's *compare* these two pictures."
"What do you think will happen when . . . ?"	"What do you *predict* will happen when . . . ?"
"How can you put into groups . . . ?"	"How can you *classify* . . . ?"
"Let's work this problem."	"Let's *analyze* this problem."
"What do you think would have happened if . . . ?"	"What do you *speculate* would have happened if . . . ?"
"What did you think of this story?"	"What *conclusions* can you draw about this story?"
"How can you explain . . . ?"	"What *hypotheses* do you have that might explain . . . ?"
"How do you know that's true?"	"What *evidence* do you have to support . . . ?"
"How else could you use this . . . ?"	"How could you *apply* this . . . ?"

Fig. 1. Precise Terminology

Posing Critical Questions

Teachers often make decisions about which classroom behaviors to discourage and which to reinforce. They do this by posing questions that cause children to examine their behavior, consider the consequences of that behavior, and choose more appropriate actions (Bailis and Hunter 1985). For example, instead of saying, "Be quiet," the teacher can say, "The noise you're making is disturbing us. Is there a way you can work so that we don't hear you?" (fig. 2).

Discussions with children about appropriate behavior, classroom and school rules, and courtesy are necessary if students are to learn respect for other people. The language of thinking will help students determine which behaviors "work" within the culture of the classroom.

Providing Data, Not Solutions

Sometimes teachers rob children of the opportunity to take responsibility for their behavior by providing solutions, consequences, and appropriate

Instead of saying:	Say:
"Be quiet."	"The noise you're making is disturbing us. Is there a way you can work so that we don't hear you?"
"Sarah, get away from Shawn."	"Sarah, can you find another place to do your best work?"
"Stop interrupting."	"Since it's Maria's turn to talk, what do you need to do?"
"Stop running."	"Why do you think we have the rule about always walking in the halls?"

Fig. 2. Questions that Encourage Appropriate Behavior

When children: (for example)	Say:
Make noise by tapping their pencils.	"I want you to know that your pencil tapping is disturbing me."
Interrupt.	"I like it when you take turns to speak."
Whine.	"It hurts my ears."
Are courteous.	"I liked it when you came in so quietly and went right to work."
Chew gum.	"I want you to know that gum-chewing in my class disturbs me."

Fig. 3. Data for Autonomous Decision Making

actions for them. Teachers can teach responsibility by giving data and sending "I" messages (fig. 3). By providing data as input for children to process, teachers will encourage them to act more autonomously, to become aware of the effects of their behavior on others, and to become more empathetic by sensing verbal and nonverbal cues from others.

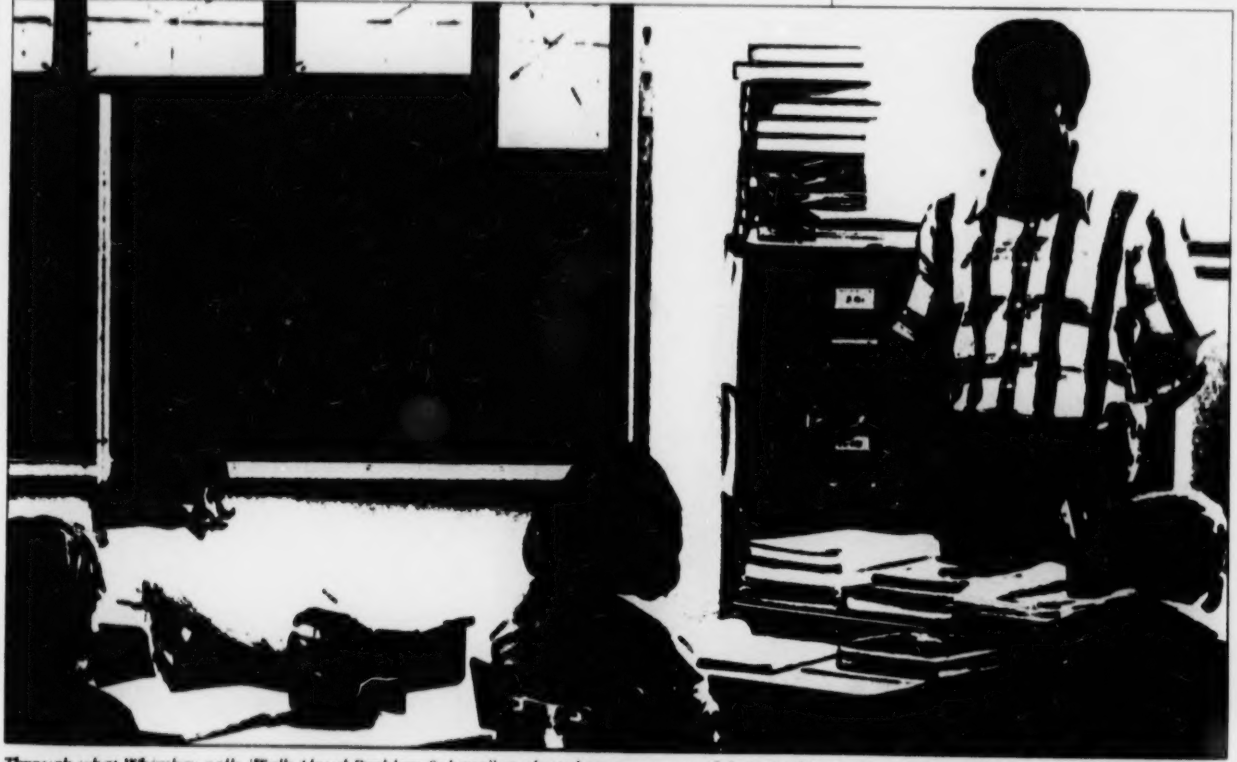
Giving Directions

When giving directions, teachers often spoonfeed students by providing so much information that they can comply without having to infer meaning (fig. 4). Instead, teachers can ask questions that require students to analyze a task, identify what is needed to complete the task, and then perform the task.

Probing for Specificity

Oral language is rife with omissions, vaguenesses, and generalizations. It is conceptual rather than operational, value laden, and sometimes deceptive. To encourage careful thinking, teachers should try to get students to define terms, be specific about actions, make precise comparisons, and use accurate descriptors (Laborde 1984). They should be alert to vague or unspecified terms, which fall into several categories:

- universals including *always, never, all,* or *everybody*;
- vague actions such as *know about, understand, appreciate*;
- comparisons such as *better, newer, cheaper, more nutritious*;
- unreferenced pronouns such as *they, them, we*;
- unspecified groups such as *teachers, parents, things*; and



Through what Whimbey calls "Talk-Aloud Problem Solving" students become aware of their thinking processes. When the child says, "I don't know how to solve this problem," the teacher replies, "What can you do to get started?"

Instead of saying:	Say:
"For our field trip, remember to bring spending money, comfortable shoes, and a warm jacket."	"What must we remember to bring with us on our field trip?"
"The bell has rung; it's time to go home. Clear off your desks quietly and line up at the door."	"The bell has rung. What must we do to get ready to go home?"
"Get 52 cups, 26 scissors and 78 sheets of paper. Get some butcher paper to cover the desks."	"Everyone will need 2 paper cups, a pair of scissors, and three sheets of paper. The desk tops will need to be protected. Can you figure out what you'll need to do?"
"Remember to write your name in the upper right-hand corner of your paper."	"So that I easily can tell who the paper belongs to, what must you remember to do?"

Fig. 4. Instructions that Teach Meaning

> **"To encourage careful thinking, teachers should try to get students to define terms, be specific about actions, make precise comparisons, and use accurate descriptors."**

- assumed rules or traditions including *ought*, *should*, or *must*.

Critical thinkers are characterized by their ability to use specific terminology, to refrain from overgeneralization, and to support their assumptions with valid data (Ennis 1985) (fig. 5).

Metacognition

Thinking about thinking begets more thinking (Costa 1984). When teachers ask children to describe the thought processes they are using, the data they need, and the plans they are formulating, students learn to think about their own thinking—to metacogitate. Whimbey (1985) refers to this as "talk aloud problem solving" (fig. 6).

As teachers require students to describe what's going on "inside their heads," students become aware of their thinking processes. Similarly, as they listen to their classmates describing their metacognitive processes, they develop flexibility of thought and an appreciation for the variety of ways to solve the same problem. Teachers, too, may share their thinking by making their inner dialogue external. Verbalizing questions they are asking themselves about ways to solve problems and sharing their lesson plans and how they check their own accuracy are ways teachers can model their metacognitive processes to students.

Analyzing the Logic of Language

Effective thinking can be fostered by having students analyze the logic implied by linguistic expressions. Certain words and phrases—linguistic cues—indicate logical relationships between ideas (fig. 7).

By examining these linguistic cues (and, or, but, after, because), students can learn to identify related ideas in a sentence and understand the relationship between the ideas (addition,

When you hear:	Say:
"He *never* listens to me."	"Never?" "Never, ever?"
"*Everybody* has one."	"Everybody?" "Who, exactly?"
"*Things* go better with . . ."	"Which things specifically?"
"Things *go* better with . . ."	"Go? Go—how specifically?"
"Things go *better* with . . ."	"Better than what?"
"You *shouldn't* do that . . ."	"What would happen if you did?"
"The *parents* . . ."	"Which parents?"
"I want them to *understand* . . ."	"What exactly will they be doing if they understand . . .?"
"This cereal is *more* nutritious . . ."	"More nutritious than what?"
"*They* won't let me . . ."	"Who are 'they'?"
"*Administrators* . . ."	"Which administrators?"

Fig. 5. Avoiding Generalizations

"As teachers require students to describe what's going on 'inside their heads,' students become aware of their thinking processes."

comparison, contrast, sequence, or causality.)

How to Grow Intelligent Behavior

Teaching students to be alert to the cognitive processes embedded in written and spoken language can help them become aware of their own language and thought. It can help them decode the syntactic, semantic, and rhetorical signals found in all languages, and it can help them integrate the complex interaction of language, thought, and action (Marzano and Hutchins 1985). By asking questions, selecting terms, clarifying ideas and processes, providing data, and withholding value judgments, teachers can stimulate and enhance the thinking of their students. ☰

When children say:	Teachers say:
"The answer is 43 pounds, 7 ounces."	"Describe the steps you took to arrive at that answer."
"I don't know how to solve this problem."	"What can you do to get started?"
"I'm ready to begin."	"Describe your plan of action."
"We're memorizing our poems."	"What do you do when you memorize?"
"I like the large one best."	"What criteria are you using to make your choice?"
"I'm finished."	"How do you know you're correct?"

Fig. 6. Thinking About Thinking

Relationship	Description	Example of Linguistic Cue
Addition	Two ideas go together in some way.	"He is intelligent AND he is kind."
Comparison	Common attributes are shared.	"Shawn AND Sarah BOTH play the violin."
Contrast	Two ideas don't go together.	"He is healthy BUT he doesn't exercise."
Sequence	One event happens before, during, or after another event.	"He went home, THEN he went to the library, checked out some books, and returned to school."
Causality	One event occurs as a result of another.	"SINCE no one was home, he went to the gym."

Fig. 7. Linguistic Cues

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chapter eight

THE TRANSFER OF INFORMATION

Unlike so many topics psychologists deal with, the environment is tangible; it is physical; it is immediately present. It is here and now. Yet, in order to deal constructively with problems of the environment, it is essential to see beyond the tangible and the present. The here and now is not enough.

Through a vast majority of the time that there have been humans on the earth, many potential problems were solved by shipping them somewhere else. Wastes of all kinds, noisy activities, polluting factories could all be put somewhere else. Unfortunately, we are fast running out of "somewhere else." There are no longer vast spaces of no interest to anyone. When one takes a larger view of the distribution of human activities in space, it becomes clear that the traditional policies of waste disposal make little sense in a crowded world.

A frequent expression of spatial myopia is a conception of human existence that might appropriately be called the *city model.* According to this model, the presence of cities proves that the world is not overpopulated. Since entities of high density can function, the rest of the country (or globe) could be of high density, too. Implicit in this model is an illusion of self-sufficiency. Cities in fact are totally non–self-sufficient. They are dependent upon the less populated rest of the environment for food, for energy, for waste disposal. It is interesting to find the city held up as an environmental model given the data on employment patterns. For a job at a given level of skill, the larger the city, the more one has to pay to find someone suitable (Hoch, 1976).

Just as the space beyond what we can immediately perceive is vital to our comprehension of environmental problems, so, too, is the time beyond the present. There is an irony in the way time influences our capacity to deal with environmental problems. On the one hand, things are happening too fast. We are subject to what Toffler (1970) called "future shock." We do not have the time to develop genetic or cultural adaptations that were available for many previous problems. The global population growth rate is vastly greater than it was in previous eras; to compound the urgency, these growing numbers of people are entering a world already seriously resource-depleted. The importance of coming to terms with the future has never been greater. On the other hand, these changes are slow relative to our capacity to perceive. The changes are gradual enough that we become habituated. We fail to notice the hazards that are creeping up on us. As Ehrlich (1968) once pointed out, if the smog in Los Angeles had begun suddenly, people would have run yelling and screaming into the hills.

Thus if people are to react appropriately to environmental urgencies, they must be able to think about circumstances distant in time and space. It is necessary to deal with calamities that have not yet happened. Planning requires compehension of what might be, of alternative uses and arrangements of space that are necessarily in the future. Given human cognitive capacities, this will be no simple matter.

It is hardly news that people learn from past experience. Since lookahead is based on previous learning, people's conception of the future must be based on the past. This works well enough for recurring events. Thus, based on past experiences (and a good deal of cultural support), people living in northerly climates come to expect winter and at the same time realize that it is not permanent. However, many environmental problems are not recurring. Instead they tend to grow progressively worse. Somehow people have to be able to grasp the implications of these problems without experiencing them innumerable times.

The necessity of conceptualizing what has never been experienced may seem to be an overwhelming challenge, but it is not unprecedented. Medieval humans were greatly influenced by a possible future that none of them had ever experienced. They had a vivid conception of Hell, and it apparently played an important role in their behavior. Hence, there is no reason to believe that people could not conceptualize and relate to a not-yet-experienced future. The issue for us here is to identify the principles whereby this conception can be achieved.

ON THE DIFFICULTY OF TRANSFERRING KNOWLEDGE

Given the urgency of environmental problems, the simple solution would seem to be to give people the information they need. The dependency of cognitive processes on past experiences, however, makes such approaches of simply "giving" people a conception of the future unlikely to be useful. Even if such a direct transfer were possible, the connection between the information and the corresponding change in behavior is not a simple one. To get a sense of how attempts to transmit information go awry, let us consider a number of examples of efforts at knowledge transfer.

☐ Scores of well-intentioned, dedicated individuals have attempted to meet this challenge head-on by educating people about the

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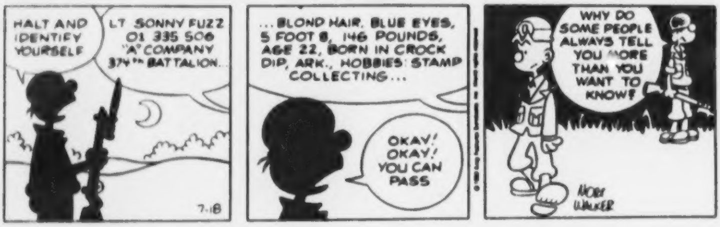
issues. Both programs with the school system and efforts to reach the public at large have been undertaken. Despite the effort and enthusiasm invested in these activities, the results have, by and large, been disappointing. The national "environmental literacy" level has remained low, and people who have been the recipients of this information have not, in general, shown the hoped-for changes in behavior. People have not even shown great enthusiasm for receiving the information, despite the fact that it is directed to their very own well-being and possibly to their survival. What seemed so urgent and obvious has turned out to be difficult and ineffective. Some observers have gone so far as to conclude that information does not matter to people after all. Could it be that the way people behave has nothing to do with information? Is it possible that people do not care whether they comprehend their environment? What has happened to the information-based, information-seeking creature we discussed in the previous seven chapters?


HALT AND IDENTIFY YOURSELF
LT SONNY FUZZ 01 335 506 "A" COMPANY 374TH BATTALION...
7-18
...BLOND HAIR, BLUE EYES, 5 FOOT 8, 146 POUNDS, AGE 22, BORN IN CROCK DIP, ARK., HOBBIES: STAMP COLLECTING...
OKAY! OKAY! YOU CAN PASS
WHY DO SOME PEOPLE ALWAYS TELL YOU MORE THAN YOU WANT TO KNOW?
MORT WALKER

King Features Syndicate, Inc.

Part of the problem here is the outgrowth of an apparent paradox. It is not that people are disinterested in information, but rather that they may feel they already have the information they need. When an individual already has information in some area, the definiteness of representations and the connectedness of maps tend to inspire confidence. While this is vital to functioning in many circumstances, it can also lead an individual to the conclusion that no new information is needed. Comparably, since new information tends to be mapped into old categories whenever possible, an individual may readily conclude that a message that bears at least some old content is "just the same old stuff." It hardly seems necessary to add that people do not enjoy being told what they already know.

☐ Geographers in particular have studied how humans react to natural hazards such as floods and earthquakes. In many cases it is possible to predict where such events are likely to take place. As we have seen, a large proportion of people ignore such warnings. Here, information that is directly related to survival is spurned. Even after such events have occurred, when their reality has been amply demonstrated, people persevere in ignoring such salient information. People who have been flooded out characteristically rebuild on the flood plain right where they were before.

Although such behavior is frustrating to experts and seemingly highly irrational, from a motivational perspective it does not appear particularly strange. Being asked to think of a disaster when to do so would leave one terrified and not knowing what to do is not an attractive option to most people. It is a circumstance likely to render an individual helpless, and this is a state people tend to avoid. It is perhaps for this reason that threatening messages are avoided. Likewise, information that confuses, that muddles one's conception of the world can undermine one's effectiveness. To some extent this may be the plight of people advised to leave their home on a flood plain. Their way of life, their way of relating to the environment may be completely tied to their territory, which they have been told is in danger. The unknowns of starting over elsewhere may be far harder to bear than the rather specific hazard entailed by staying put.

The reaction to natural hazards would be more bizarre than frightening were it not for its parallel to the reaction to many environmental problems. Watt (1974) has referred to the human tendency to find enormous disasters unthinkable as "the Titanic effect." The Titanic was regarded as unsinkable; not only did the crew never take warnings of nearby icebergs seriously, but even after the collision there was a refusal to believe that anything serious had happened. Watt sees the possibility of running out of the earth's resources as comparably unthinkable for most people.

A slightly different version of the cognition of disaster is put forth by Catton (1975). He suggests that the recent boom of unprecedented affluence was the result of exploitation of nonrenewable energy resources. Many people believe, however, that it was technology that brought these many gifts. Hence they look to technology to restore their luxurious circumstances. Catton considers this pattern of belief a form of "cargo cult." The original cargo cults arose in the South Sea Islands, which experienced boom times when they became American air force bases during World War II. The cargo cultists believe that some day a big bird will come again from the sky, bringing great riches as it did in the past.

☐ Environmental professionals, particularly those in the area of environmental design, are coming to recognize the importance of information about people. At the same time there has been no lack of research in this area, resulting in a growing body of literature on the behavioral effects of design. A widely held feeling among the researchers is that this newly generated information is routinely ignored. This feeling is often expressed in terms of the "gap" between the researcher and the practitioner. It is a source of considerable frustration that this information, which seems to be needed and perhaps even wanted, is not being used.

As is all too clear from the preceding examples, cognitive maps cannot be transplanted directly. The hard-earned knowledge in one head cannot become the easily acquired knowledge in another head through some simple telling process. Certainly years of experience can be expressed as a written summary, and that summary can be read and even memorized, but it is unlikely that comprehension will be transmitted in this way. It is even more unlikely that such an approach will produce the desired change in behavior.

The Portable Model

Although this direct attack on the problem is unlikely to be effective, there is an indirect route that has great potential. As we have seen, people's perception, their thought patterns, and ultimately their behavior are greatly influenced by their model of the world—or their model of the particular aspect of the world they are trying to cope with at any particular moment. People are indeed resistant to attempts to tell them what to do or even to facts that they have no idea what to do with. However, they are eager for information that helps them understand and relate to the world more effectively. Thus information that aids in model-building is likely to have far more impact than information that may seem more directly related but fails to speak to that agenda of implicit questions people have about the world.

The third example of unsatisfactory information transfer that was just described provides a good example of this indirect approach. The researcher produces data that, it is hoped, the environmental designer will use in the design process. As it turns out, such data are rarely used, for a host of reasons. The designer has trouble locating the data when they are needed, the data fail to speak to the particular problem at issue, and, anyway, projects are always put together under considerable pressure with little time for finding and reading and relating.

Much of the information in question here arises from environment and behavior research. Even though the designer does not read it, designing requires that one have some notion of what people are like. This notion may be vague; it may be distorted; it may be downright misleading. When the pressures are on, however, one uses the model one has. If the environment and behavior research were to offer a model instead of a collection of data, it might get used in time of need. It cannot be just any model, however; it must be a *portable model, that is, a model that is simple enough and intuitive enough to be carried around in the designer's head.* If the model is part of the designer's way of thinking, it will be used. Data are impor-

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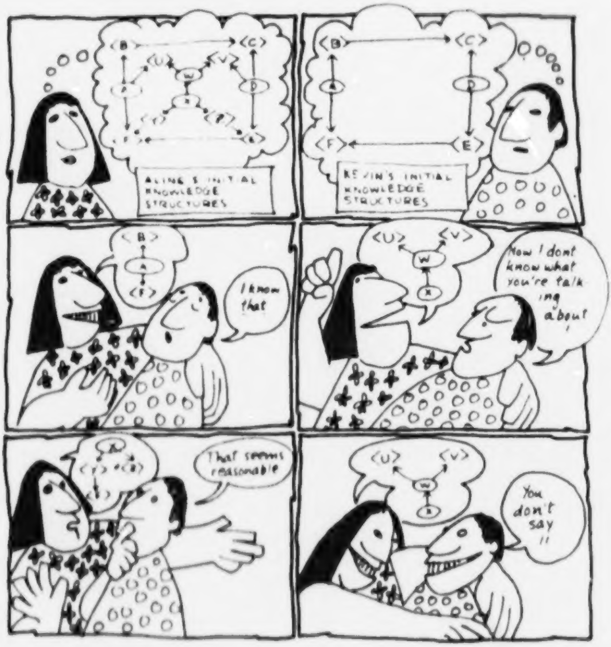

ALINE'S INITIAL KNOWLEDGE STRUCTURES
KEVIN'S INITIAL KNOWLEDGE STRUCTURES
I know that
Now I dont know what you're talking about
That seems reasonable
You don't say !!

From Human Information Processing by P. H. Lindsay and D. A. Norman © 1977 Academic Press, Inc.; reprinted by permission of the publisher.

tant in constructing such a model and in providing evidence for it, but data alone rarely influence behavior.

Too often have information-providers set out with inflated expectations. Talk of behavior change is intoxicating stuff. Since unconfirmed expectations can be painful, it might be wise to adopt a realistic stance at the onset.

A portable model, even if intuitive and cogent, is unlikely to be adopted by people who have not yet recognized the need for one in a given area. Nonetheless, being intuitive and cogent, it has a good chance of being remembered. Then, when that aspect of an individual's world begins to fall apart, an alternative interpretation may be available. As far as environmental deterioration is concerned, we can count on more and more human impact as time passes and hence on more and more people suddenly open to new models.

It is also the case that behavior does not change merely because a model changes. Many people now share the model that casts public transportation in a far more reasonable role than the private automobile. Yet as long as public transportation tends to be noisy, dirty, inconvenient, slow, and not notably less expensive than automobile travel, the holders of these models are unlikely to change their behavior. Behavior is a function not only of models but of the environment as well. Environmental support for environmentally sound behavior is at least as important as appropriate cognitive structures. In the long run, after all, the environment is the source of our cognitive structures.

SOME PRINCIPLES OF KNOWLEDGE TRANSFER

Identifying Units

If the transfer of knowledge depends upon the recipient's capacity to build a model of the material, then our first concern must be with units, since any model must ultimately function as an interconnected set of cognitive units. Without the basic units, there is nothing to interconnect. Education often fails because the learner lacks the basic units. The teacher presumably does not realize this because (a) the student has been *told* what the units are and (b) not only does the teacher have the units, but they are evoked by the words that refer to them. The result is that the student acquires a "model" of interconnected words rather than concepts. Based on experiences of this kind, some people decide that "what you learn in school" has little applicability in the real world.

Flow diagrams, as we have seen, often lead to a similar situation. People have become facile at drawing boxes around words and drawing arrows between the boxes. A box around a word certainly makes it look much more like a thing, a basic unit, but if careful thought has not preceded the drawing of the box, the result is still just a word, although now a word with considerable pretensions.

The first step in working with the units involved in a body of material must be to identify them. They must be distinct from each other; they must cover all the central concerns of the material. They must, in other words, provide the basic vocabulary that, along with the relations among them, is sufficient to provide a structure for the material. These are difficult requirements calling for a careful analysis of the issues in question.

The Meaningfulness Principle

Knowing what the key units are does not in itself guarantee effective information transmission. It is a necessary condition but not a sufficient one. The fact that the key units have been identified does not guarantee that the information receiver has appropriate corresponding units. Even having them does not mean that they will turn on at the right time. For a body of information to be useful to someone (and for it to have a chance of influencing behavior), it must be connected both within itself and to pre-existing knowledge. It must, in other words, form a coherent pattern.

To form a coherent pattern, a body of material must, in effect, tell a story. It must have connections leading from one part to the next. In this way sequence is established and a structure created. And structure is, as we have seen, a powerful factor in the comprehension of information. A study of visitors' reactions to informational displays in interpretive centers supports this principle. Structured presentations were of substantially greater interest to visitors than were fragmented presentations (Wagar, 1974; Washburne and Wagar, 1972). Although not originally stated as a facet of cognitive functioning, this principle has been a part of the lore in nature interpretation instruction for many years (see Hammitt, 1981).

Another aspect of forming a coherent pattern is providing the information in such a way that it is relatable to the individual's prior knowledge. This is what might be called the "starting where they're at" principle. In order to make connections to pre-existing structures, one must know what structures are there. There is rarely a time when one does not benefit by exploring with one's intended recipients the pattern of understanding that they start with.

At other times it is beneficial to use an approach that takes advantage of the amazing cognitive power of questions. Perhaps more than anything else, the sort of information people will be most eager to get and most attentive to is the information that answers their questions. Answering questions greatly increases the likelihood that one is relating material to pre-existing cognitive structure. In addition, the very asking of a question seems to be enormously effective at activating the relevant portions of this pre-existing cognitive structure. Even with relatively simple-minded questions, information seems to be more salient when in answer to a question. In a memory study, for example, some participants were given questions to ask. They remembered the answers better than did the control group, which received only the answers (Berlyne, 1954, 1966). At a higher level, a major component of the Socratic method of teaching involves getting the learner into a questioning mode; it is then that the learner begins to wonder about the very issues the teacher is trying to communicate.

Questions depend on an individual's cognitive structure. As such, a question not only provides for a clear place to put the new information, but also is a sign of recognition that it is needed. Being in a questioning mode thus constitutes a striking contrast to those times when the individual, through definiteness and connectedness, is disinclined toward information.

Some questions are explicit. When one suddenly stumbles upon a gap or discrepancy, when one has difficulty recognizing, or predicting, or evaluating, or acting, one is quite aware of having questions. In addition, though, people carry with them a large agenda of implicit questions. Certain things whose workings one never really understood, things that never quite fit in, that failed to make sense in terms of some larger picture, constitute the sort of unfinished business implicit questions are made of. They involve the extension, clarification, and general improvement of one's model of the world. They are appropriately considered questions in that people are eager for such information and readily bring up the cognitive structure it pertains to.

Capacity Limitations

All these possibilities would be far less demanding if they could be handled quickly and simply. But, alas, they take time. A human can absorb only so much information at once. Beyond that, increasing input produces rapidly decreasing returns—and might even undo what has already been accomplished. The capacity to hold in active memory only some 5 ± 2 units (or "chunks") of information at one time (Chapter 5, Note 1) is indeed a severe limitation. In fact, from the point of view of trying to transfer information, it is hardly safe to assume that one can therefore aim for seven or even five units. If an explanation requires five concepts and the recipient is not functioning after the third one, the difference between what is delivered and what is received will be great. For practical purposes the "magic number" is three. Surely a speaker who promises to deliver "only three main points" is more reassuring than one who threatens to offer "only seven main points."

The dislike of being overwhelmed with information is unlikely to be a recent development. What has changed in the relatively recent past is the availability of information. As Simon (1978, p. 13) has pointed out, we now have far more information than we have attention to deal with it:

> In a world where information is relatively scarce, and where problems for decision are few and simple, information is almost always a positive good. In a world where attention is a major resource, information may be an expensive luxury, for it may turn our attention from what is important to what is unimportant. We cannot afford to attend to information simply because it is there.

Having some feeling for capacity limitations is vital because it is otherwise all too easy to overload the intended recipient. Clearly there are compelling reasons for wishing to avoid overload. First, it leads to a certain amount of information being ignored or otherwise lost—and one never knows which part that will be. Second, it is a painful experience for the recipient. There is often enough pain in absorbing strange and unfamiliar ideas without adding to it unnecessarily. Third, it is implicitly coercive. Since overload produces pain, the recipient will be motivated to leave. If the recipient has not left, there must be something in the situation preventing departure. Coercion in education is sometimes unavoidable. Since cognition is intimately related to feelings, and since what use of the information occurs later will depend to a large degree on these feelings, coercion is not the method of choice.

On the other hand, the capacity limitation need not present insuperable difficulties, thanks in part to the hierarchical nature of the system. Although one may be able to handle only three main ideas at once, one may be able to handle several examples for each as well as a higher level representation that ties the three ideas together. Further, what constitutes a unit depends to a large degree on the recipient's prior knowledge—on the pre-existing units and structures. As we saw in Chapter 7, experts, by virtue of great familiarity with an area of knowledge, can handle much more information at one time in their area of expertise.

A powerful argument for self-pacing, for allowing the recipient to control the rate of information flow, follows from these considerations of capacity limitations. While one can very likely squeeze the information in at a faster rate when the recipient is not the one controlling the rate, there may be little gain in terms of what ultimately happens to the information. New information can interfere with the mental activities relating to the comprehension and storage of the prior information.

It is instructive to look at the operation of these general guidelines in terms of what happens when they are not followed. A classic experiment on memory for meaningful material provides a useful example. Bartlett (1932) asked participants to reproduce from memory stories that they had read. The stories were Native American folktales, quite unfamiliar in structure and content to the British college students participating in the study. Further, only the first of a series of participants read the original story. The first participant wrote the story down from memory and passed it on to the next reader. In this way each "chain" produced ten successive stories based on the same original, each a little further removed from that original.

The transformations in the retelling of these stories were remarkable. Bartlett identified three different trends:

- **Leveling:** details tended to drop out. The stories became simpler.
- **Sharpening:** some details were not only retained, but sometimes even exaggerated. In other words, landmarks were created.
- **Rationalization:** the story came to be more coherent. It came to make better sense in terms of the experiences and expectations of the readers.

One way to look at these transformations is that the readers, finding the raw material they were presented with difficult to comprehend, made whatever modifications they found necessary to make the material manageable. *They created landmarks, which they placed in a simplified structure that had connections to their prior experience.* In other words, they forged cognitive maps for themselves. Such maps may be extracted even from rather unpromising material—but at a cost. In this case the information underwent considerable distortion in the process. There are many times when people simply ignore material that is hard to map. If they must deal with it, however, they seem to be quite capable of making the adjustments necessary to meet their cognitive requirements. Being unwilling to accommodate to human cognitive patterns in the information one provides may not prevent transmission. It may simply render the resulting "understanding" unrecognizable.

SOME WAYS OF PRESENTING INFORMATION

Even if one is working with clearly identified units, a good sense of the knowledge of the intended recipient, and an appreciation for how little material one can deal with at one time, one still has to make decisions about how the material is to be presented. Certainly whether one is trying to build new concepts or reawaken old ones will make a difference. Nonetheless, it is possible to identify two properties that are vital to any material that is intended to mediate successful knowledge transfer.

☐ What one presents should be *vivid,* calling on material that people care about (see Nisbett and Ross, 1980, Chapter 3). For a variety of reasons certain material is unusually effective at holding people's attention (see Chapter 5). Attention is, of course, essential; without it all else is lost. On the other hand, using material just because it is vivid, although it is otherwise irrelevant, can be a serious error. In such cases the material becomes a distraction, calling attention to itself and away from the intended content. How often, despite all the ingenious tricks, do commercials fail in accomplishing their basic mission: that one remember the brand! There is the story of a former student meeting up with a teacher from some years back. They reminisce together, and the student tells the teacher how she will never forget the day when the teacher startled his class by standing on the desk and telling the students, "This is the most important point to remember about the English language." "I don't remember what you said," the former student continues, "but I'll never forget your standing there."

☐ What one presents should be *concrete* so that it can be imagined, visualized, related to. As Rosch (1978) has demonstrated, people have a preferred level of thinking that involves concrete objects. Thus most people deal more effectively with the concept of "hammer" than with the concept of "tool." At the same time they do better with "hammer" than with some specific kind of hammer (unless their experience has inclined them to have highly differentiated hammer concepts). Concreteness is often introduced into domains whose very abstractness may make them hard to think about otherwise. Religions and cultures often clothe abstraction in rituals, where concrete sensory patterns and concrete actions make otherwise remote ideas tangible. Nisbett et al. (1976) have pointed out how little influence abstract information can have. They contrast this with the huge impact often carried by even casual and unreliable information when experienced in concrete form. (They are so impressed with this phenomenon that they call the conclusion of their paper "communicating with creatures of concreteness.") Fund-raisers have long taken this advice to heart.

On Gaming and Role-Taking

One method of presenting information that tends to be vivid and concrete, and that has received considerable attention in recent years, is gaming (Chapter Note 1). Certain facts about games are immediately evident. Gaming is an activity characterized by great involvement on the part of the participants. It is also a procedure that automatically communicates that there is a need to build a model without actually having to come out and say so. Striving to acquire a model (usually described in gaming contexts as "learning the rules") is a great asset, and any procedure that achieves this deserves our careful scrutiny.

Environmental games often call for the adoption of highly structured roles. Game participants might, for example, be asked to play from the perspective of central government or the perspective of the general interests of the community, of a land speculator, a planner, or a police officer. Playing a structured role is supposed to put one in someone else's shoes. In this way one is supposed to understand how the other person feels, what pressures control the other person's activities. This may give one the feeling of deep insight, but it is almost certainly an illusion. Having the feelings of another requires having the experiences that created the cognitive structure that resides in the other's head. This does not happen merely by taking on the other's part in a game.

The inclination to regard oneself as capable of putting oneself in the shoes of another is widespread and occurs outside the context of gaming as well. Environmental designers are sometimes encouraged to do this (Jensen, 1974). Canter (1977) describes one architect who reaped considerable publicity by living for several weeks in a housing project he had designed. As Canter rightly points out, however, all the architect found out was what it was like for an *architect* to live in that project! There is, alas, no magic that can transport one to the shoes of another. An alternative strategy is to provide the people whose shoes are in question with some basis for understanding possible alternatives. Simulation, which can be so helpful in achieving this goal, is discussed in the next two chapters.

The involvement of games is hard to resist. While this is one of their assets, it is also a potential liability. It is a liability in part because one can become so motivated by the game aspect that the content issues become overshadowed (see R. Kaplan, 1976). Involvement can be distracting, particularly when it is external to the content, as is readily the case in gaming. At the same time, games readily become coercive. One is under great pressure to participate fully, that is, to play the role one is assigned and to follow the rule structure imposed on the situation.

Some of the greatest assets of games do not necessitate a gaming context. Involvement can be achieved in other ways as well. Physical models of the environment are often sufficiently engaging that they can be used directly as modes of information transfer without the artificial aspects that a game brings with it. Comparably, many environmental problems have built-in requirements and constraints (e.g., see Steinitz, 1981) that make an imposed rule structure unnecessary.

On Analogies

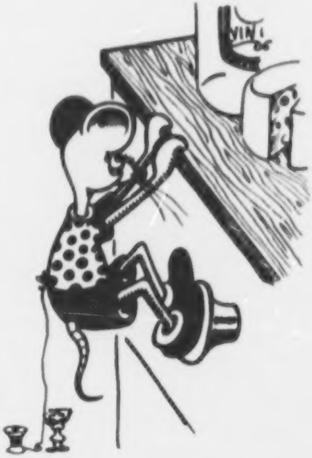
One of the strengths of the gaming approach is the use of a concrete pattern to stand for something more complex and initially unfamiliar. An approach that is in some respects similar involves the use of analogies. There are times when a familiar or easy to understand pattern can convey a great deal of information about something that might otherwise be quite obscure. The description of mountain-climbing tech-

High Adventure On Cupboard Rock

How Mickey and Minnie Mouse Sew Up A Climb

Our scene opens with this mouse, Mickey, carefully scurrying up a kitchen cabinet after some goodies—as mice are inclined to do on occasion. He is hauling the end of a thread with him (actually, it's tied around his waist). Below him is another mouse, played by Minnie, and she's holding the same thread at a point between Mickey and the spool. As Mickey climbs, Minnie pays out the thread so that it is always slightly slack. Minnie has also tied herself to the cabinet so as not to fall or be pulled off.

Now if Mickey went 30" above Minnie, stumbled and fell, he would fall 30" to Minnie. This would cause 30" of slack thread to build up, and Mickey would have to fall another 30" below Minnie before the slack paid out; a total fall of 60". That long a fall is pretty hard on the ole gut. Well, it's really not the fall that hurts, but the sudden stop at the end.



Let's go back and watch Mickey start again—the correct way. Instead of climbing the full 30" at once, he only climbs 5", stops, drives an upholstery tack into the cabinet with his little mouse hammer, and attaches a jeweler's clasp to a hole he has drilled through the tack's head. He then clips the thread into the clasp. Now, if he slipped, he would be held by the tack, clasp, and thread which Minnie is holding the other end of, and would hardly fall any distance at all. If, as he continues to climb, he attaches his thread to the cabinet every 5" in this manner, he will not be able to fall more than 10" no matter how high he goes. Much safer this way.

When Mickey gets to the top shelf, he scoops up the Camembert cheese and rye thins, sets up his thread for the descent, and slides down with the goods. Whereupon

Minnie says, "Gee, that was great, Mickey, but wouldn't it have been easier to walk up the other side without all this hoorah?"

"I guess so," replies our hero, "but I dig it." And together they polish off the succulent morsels, washing them down with a thimbleful of white wine (Liebfraumilch, Blue Nun, vintage 1968).

Afterword. *Substitute rock, snow, or ice for cabinet; leader for Mickey; belayer for Minnie; rope for thread; piton, chock, or bolt (nah—we don't like bolts!) for tack (point of protection—anchor); carabiner for clasp; and rappel for "slides down." If we've done this right, you'll have a pretty good idea of what free climbing is.*

From Explorers Ltd. Source Book, *story by Chris Patterson, art by Bill Mack, reprinted by permission of Explorers (ETM) Ltd © 1973*

niques (see box) shows an ingenious application of this approach. Note, however, that both the analogy and the information to be conveyed are concrete. By contrast, the description of how paging systems work in digital computers (see box) illustrates how helpful an analogy can be for giving concreteness to a description that otherwise might seem hopelessly abstract.

Another popular use of analogies is in their use as vehicles for understanding natural processes. There has, for example, been something of a tradition in psychology of using physical models in exploring mental processes. Freud used the analogy of a hydraulic model, calling upon a knowledge structure presumably familiar to readers of that time. Since then the telephone switchboard has served as a model of the mind, followed by the digital computer, and, most recently, the hologram. Despite the great advantage of being able to call on pre-existing structure, such analogies have an inherent difficulty. They apply to an unknown degree. At some point they break down, and precisely where that point is located is rarely clear. Not infrequently one hears that the mind is like a filing cabinet. It undoubtedly is in certain respects. It does hold information, and it is organized. As we have seen, however, there are a great many ways in which the mind is not like a filing cabinet. Such borrowed structures lack built-in markers telling us which respects are the salient ones and to what extent the analogy holds.

On The Usefulness of Graphic Material

In our consideration of material that is both vivid and concrete, graphic material would have to be considered a strong candidate. In earlier chapters we saw that the cognitive process itself seems to be built on

Paging

Below are two descriptions of the paging process, an arrangement used to increase the effective memory capacity of a computer. The description on the left uses traditional computer terminology; the description on the right is parallel, item by item, but replaces the jargon with concrete and familiar terms.

The Paging System—Rules

1. Any computer job can have up to 16,777,216 **bytes** of memory at once.
2. Memory is divided into **pages** of 4096 bytes each.
3. Pages are stored either in the **real memory** or on a **paging device**. The real memory is almost always too small to hold all the pages.
4. There is only one real memory (eight million bytes of storage) and four principal paging devices (IBM 2305 fixed-head file storage units). All the jobs share them.
5. Each byte has an **address**.
6. What you do to bytes is to **reference** (i.e., store data in or fetch data from) them. Jobs take turns referencing.
7. Jobs can reference only their own bytes, not anybody else's.
8. Bytes can be referenced only when they're in real memory.
9. Only the **operating system** (i.e., MTS, the supervisor, and paging-device program) knows whether a byte is in real memory or on the paging device.
10. The longer a byte (or a page) goes without being referenced, the **less recently used** it is said to become.
11. The way a job gets bytes is to request them from the system. Memory is allocated in groups of eight bytes (doublewords) to make the system's recordkeeping process easier.

The Crafting Game—Rules

1. You can have up to sixteen million **things**. So can everybody else.
2. Things are kept in **crates** that hold 4,096 things each. Things in the same crate are called cratemates.
3. Crates are stored either in the **workshop** or a **warehouse**. The workshop is almost always too small to hold all the crates.
4. There is only one workshop and four warehouses. Everybody shares them.
5. Each thing has its own **thing number**.
6. What you do with a thing is to **zark** it. Everybody takes turns zarking.
7. You can zark only your things, not anybody else's.
8. Things can be zarked only when they're in the workshop.
9. Only the **Thing King** knows whether a thing is in the workshop or in one of the warehouses.
10. The longer a thing goes without being zarked, the **grubbier** it is said to become.
11. The way you get your things is to ask the Thing King. The Thing King gives out things only in bunches of eight. This is to keep the royal overhead down.

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the demands of a visual/spatial environment at least as much as on the demands of a verbal one. People readily understand visual material; they often use visual and spatial expressions to try to understand abstract concepts.

The emphasis on the visual/spatial presentation mode has not, however, gone unchallenged. The argument has been made that this constitutes far too much concern for "visual information," for the "appearance of things." This is an understandable misconception, but a misconception nonetheless. Information received in the visual mode is not "visual information"; it is information. If one determines by way of vision that a lion is stealthily approaching, then the appropriate conclusion is that a lion is approaching, not a "visual lion" or the "visual image of a lion." Vision, like the other modes of attention (Gibson, 1966), provides information about the world. It provides information that is the domain of other senses as well as vision. In humans, of course, the visual mode is particularly rich in the number of dimensions it is sensitive to and in the discrimination it can make. It is also a mode that people tend to trust (Posner, 1978; see also Chapter 2).

Since vision is oriented to things and spaces in the world, and into what the things and spaces afford for the viewer, what one achieves through vision is not "mere appearances" but a complex assessment of what one's possibilities are, of what one could do. It is this functional world that one experiences; vision is one of the most effective means humans have for finding out about it.

Photographs are a particularly useful mode of presentation in many cases. They provide an easy means of showing various examples of possible approaches or solutions to a problem. They seem to be understandable by people across different cultures (Collier, 1967; Kennedy, 1974). In practical terms (and for research purposes, too), this means that the capacity to deal with photographs is close to universal; there is no concern about literacy levels, as might be the case with verbal material.

There is also a growing body of literature pointing to the validity of a photograph as an environmental surrogate. This issue has been particularly carefully studied in the area of landscape assessment, where it has been repeatedly demonstrated that people's ratings of an environment are very highly correlated with their ratings of pictures of that environment (Chapter 4, Note 2). On the other hand, there is some evidence that ratings of a photograph of some aspect of a setting are not necessarily similar to ratings of a corresponding brief verbal description. The verbal description seems to encourage a highly stereotyped reaction (R. Kaplan, 1977a).

It is not only the case that people understand photographs; they also enjoy looking at them. This bias toward the visual and spatial was turned to great advantage by an anthropologist. Finding that his informants soon tired of answering questions, he requested permission to take pictures. When the pictures were printed, he asked if his informants wished to look at them and comment on them. They were delighted to do so, providing extensive interpretation and analysis. In one case an expert weaver who had resisted the picture-taking process reacted to the resulting photographs in an unexpected fashion. He indicated that the photographs were unsatisfactory; they did not show the important steps, and they must be taken again. During the retakes he told the anthropologist exactly when the picture should be taken; he also rounded up some weavers who had trained with him to have pictures taken of slight variants in the process (Collier, 1967).

The positive reaction people tend to have toward photographs points to the feasibility of using such a procedure for knowledge transfer. Photographs are effective for many environmental issues since one's experience of the environment so frequently comes from visual and spatial information.

There are times when photographs of how environments are structured in other places give one a good idea of what the possibilities are. There are many times, however, when the unique properties of a particular setting limit the usefulness of photographs from elsewhere. In such cases the cognitive principles we have discussed strongly suggest environmental simulation as a promising means of information transfer. Essentially the goal is to present information in a form that facilitates forming a cognitive map. A simulation does this very well or, rather, is capable of doing it very well. Here, too, it is possible to function in many different modes, some far more supportive than others of human cognitive functioning. A number of these issues are discussed in the next chapter.

SOME CONCLUDING COMMENTS

People prefer environments in which they can make sense of what they perceive and in which they can learn more. When a person becomes an information recipient, those preferences remain pertinent. Some communications expand a person's comprehension; these tend to be valued and even to be sought. Some communications either are hard to understand in themselves or make the world harder to understand. These are, not surprisingly, ignored or avoided. People are motivated to achieve clarity; they tend to evaluate information in terms of its contribution to this process.

If people's reactions to information can appropriately be cast in a larger preference framework, then the same factors that predict preference in other contexts should apply to the messages people perceive.

Here the parallels to Chapter 4 are quite straightforward. *Complexity* is important in that a message must be about something to be worth attending to. It must have substance; it cannot be trivial. *Coherence* refers to the unity necessary for a message to fit together, to form a whole. *Legibility* is a particularly important aspect. It involves the feeling that one is gaining in comprehension, that one has a sense of increasing grasp. *Mystery* functions as a sense of open-endedness. It involves the feeling that there will be more to learn, that the communication points to new possibilities still to be explored.

Just as the sharing of knowledge can be related to the prior discussions of preference, it can also be tied directly to the cognitive map material. Sharing knowledge, after all, can be viewed as a process of attempting to assist someone in building a cognitive map. A cognitive map cannot be transplanted; that much is clear. It must be built by its new owner-to-be, but this by no means rules out the possibility of assistance. To begin with, a cognitive map is easier to learn if the units are coherent within themselves and separable from each other. Secondly, there is the matter of respecting what the learner already knows and providing new information in a way that is both coherent and relatable to that prior knowledge. Such an approach has both cognitive advantages in terms of connectedness and the motivational advantages that go with the satisfaction of extending one's knowledge. In one's eagerness to be helpful, however, there is a danger of providing too much information. Here, too, violation of the principle can be costly on both cognitive and motivational grounds.

The attempt to communicate knowlege thus presents a study in contrasts. The communicator is clear, organized, eager. The intended recipient of the information is readily susceptible to diffusion, confusion, and overload. One can sympathize with both perspectives, but if the communication is to be effective and the experience is to be a positive one, it is the perspective of the recipient that is paramount. Understanding and respecting the cognitive requirements of the intended recipient constitute probably the single most effective step one can take in improving the process of sharing knowlege.

NOTES

1. Gaming

The literature on gaming is diverse and growing. Horn's (1977) volume provides detailed description and information on hundreds of games. The title of their chapter notwithstanding, Fromkin and Steufert (1975) present a great deal of material on this topic. Duke and Greenblat (1979), Sanoff (1979), and Tester (1974) present a variety of environmental and design-oriented games. Despite the emphasis on user participation and on the educational aspects of games, however, much of the material is low on imagery. Nonetheless, these sources are useful in showing how readily games can be adapted to a wide range of settings.

Success Stories: Imagery by Example

LISA BARDWELL

ABSTRACT: Learning about environmental issues, their complexity, and urgency can be overwhelming. In this article, the author suggests that positive examples offer a refreshing change from the more typical doomsday warnings or edicts for action. While acknowledging environmental realities, these stories establish a norm for seeing those realities as challenges. They hold promise in terms of helping people build more adequate models about environmental problems and about their roles in addressing them.

I have a friend who epitomizes what many Americans regard as success. He holds a high-level administrative job at a top university. He owns a beautiful home in the country with every modern convenience, three cars, and a sailboat. He seems to have everything—a good marriage, two healthy children, and a bright future. . . .

And, he feels helpless. He turns off National Public Radio when it reports on the environment. He refused a t-shirt depicting the invasion of African honey bees because it was too depressing. "This is the kind of stuff that makes me feel so helpless. It shows me a crisis but doesn't give me a solution," he said.

Well educated, he has the resources and the contacts to make a difference. Yet, he has turned his back on most environmental issues because they seem so overwhelmingly inevitable and impossible to rectify. He is only one example of the fact that many efforts to motivate people about addressing these problems often miss the mark. One cannot help but wonder if there are more effective strategies for informing and involving people than grim exposés and recounts of environmental disasters or edicts of "what you should do."

This article explores another approach, one that acknowledges the gravity and urgency of environmental issues but offers perspectives that help people see possibilities rather than inevitabilities. It presents an understanding offered by cognitive psychology to explain why such an approach works. It claims that using success stories—narrative descriptions of successful efforts by ordinary people to bring about environmental change—can provide the imagery, even the inspiration people need to take action.

Beyond Just Knowing: A Cognitive Perspective

Whether it entails hauling one's recycled materials to the curb or standing in front of timber trucks headed for an old-growth forest, a public is needed that is willing to think about and act on environmental problems. One cannot assume, however, that simply giving the right information means people will respond appropriately or that they will even respond at all (see Gray 1985). A number of other reactions are as likely as willing commitment. For example, being told what to do or think can result in outright resistance or reactance (Brehm 1966). Awareness about the overwhelming prospect of nuclear war can precipitate apathy and depression or "psychological numbing" (Markusen and Harris 1984). Perhaps most widespread is the tendency to simply opt out. It is easier to leave the problems to someone else,

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especially if one is convinced that his or her actions will not make a difference or that solving the problem is someone else's responsibility.

Just knowing about the problem, then, is not enough. "It appears that environmental education continues to hold the belief that citizenship action can be brought about through a focus on environmental knowledge and awareness, although a growing body of research indicates otherwise" (Volk, Hungerford, and Tomera 1984, 17). The seemingly logical link between gaining environmental knowledge and acting on that knowledge ignores some informational and psychological concerns. A cognitive perspective contends that people are not inherently apathetic. Instead, they are eager to understand and interact with their surroundings (Kaplan and Kaplan 1982). People's active participation, however, depends on several factors:

1. Concern: how one understands and responds to the issue
2. Competence: whether one feels capable of addressing the issue
3. Imagery: what ideas or alternatives one has for what to do

Generating Concern: Cognitive Considerations

Certainly, in terms of action taking, it is important that people care about the issue. An understanding of how people perceive and respond to information suggests that it takes more than simply providing the fact to generate concern.

Map-building and Cognitive Limitations

Everybody can attest to the fact that people do not carry duplicates of the world around in their heads and that they do not and cannot pay attention to everything. Nevertheless, they must be able to understand their environment well enough to function and react appropriately (Kaplan and Kaplan 1982). In evolutionary terms, one's ability to make sense of one's environment was, at one time, a matter of life or death—those who misidentified predators did not last long.

Rather than randomly sampling information in the environment, people rely on models—cognitive maps they build through life experience. Things that happen in sequence or objects that tend to occur together become associated in the mind. People have a cognitive map, for example, of how to get around a neighborhood. They recognize landmarks—houses, special gardens, the mail box—which tell them where they are. These landmarks are connected so that people can go from one to another. Initially, people probably follow the same route to avoid getting lost. But, as they become more familiar with the spatial arrangement of the neighborhood, they start to take short cuts or explore its boundaries. Eventually the map, although not a facsimile, is complete enough that certain parts of it can be recalled in great detail. At the same time, people can step back from it mentally and see the neighborhood as a whole. They can explain to someone how to get from here to there, even if they have never done it themselves. And, they can imagine how changes might affect its character.

People also have cognitive maps of less physical "spaces," of how things work, of how to act, of who they are, and of what they can do. As they encounter more examples and responses to their actions, their map becomes richer, the meaningful connections more established. They recognize what is an anomaly and what is not. They gain flexibility in that they can think about and can experiment with what they know. They can apply their maps to other situations.

The beginning cook, for example, follows the recipe religiously. With experience, the cook learns what ingredients can be altered and amended, what procedures are critical, and which are not. Over time, the cook can improvise, having developed a sense for what tastes mix well, how different ingredients react together, what procedures produce what results, and whether or not a recipe sounds "good." And, having mastered the subtleties of making bread, the aspiring cook may transfer that map to trying a hand at pizza.

Familiarity Bias

The main point made above is that cognitive maps are how people organize their world. Maps shape how they interpret and respond to their environment; they mediate what they notice and care about. Because maps make it possible to do something in a fairly unpredictable world, people place a premium on using the maps they already have. They tend to notice and rely on information that reinforces or builds on those maps. That information seems relevant. Information that does not fit very well—that is, information too far removed from one's frame of reference—is ignored. Although eager to enhance these maps, people are reticent to give them up. People hold fast to their ways of seeing the world. A wonderful story is a case in point: In the early 1900s, people could not believe that the population of Manhattan could ever exceed 5 million. What, they reasoned, would be done with all the horses?

Responses to Confusion

Confusion arises when one's efforts to make sense of the world fail. This may be because one cannot make new information fit the model or the understanding one already has. Or it may be because one's ability to attend to information—typically two to five different concepts at any one time (Mandler 1975)—has been overwhelmed.

Either way, being confused is painful. Humans want clarity (Kaplan, in press); they will tenaciously strive for some kind of closure, no matter how inappropriate.

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Typically, people problem-solve or look for an interpretation that incorporates the new information. If that effort fails, they may respond with anger and frustration. Or they may quiet their confusion by selectively ignoring or denying some of the information.

This affective component of confusion is especially salient in education. Being challenged involves some confusion and mental pain—cognitive dissonance. Nevertheless, the negative response to a learning situation in which one feels barraged by information, coerced, or bored can extend to the subject itself. Best intentioned but cognitively overwhelming efforts to tell people how to live and what to care about may actually turn them off. Any effort to teach environmental issues that ignores how people use information will be ineffective. The information must be sensitive to cognitive limitations. No matter how essential or informative, much of one's message will be lost if it is not organized so that people can retain it (e.g., conveying no more than three to five major points).

The information must be at least a little familiar. People are less likely to dismiss information that relates to the understanding that they already have of the world. They are more likely to care about material that touches on their experience. It is not surprising that citizens are more *actively* concerned about issues close to home that affect their lives directly. Implicit in the adage "Think globally, act locally" is the recognition that it is very difficult to mobilize people for large-scale global issues. Linking the larger cause to more familiar, accessible aspects of one's life may help people see the connection and offer them a tangible outlet for their efforts.

Empowering the Concerned: Competence and Imagery

There is more to action taking than concern. One's sense of competence and imagery for what to do can determine the difference between participation and helplessness. Feeling empowered implies a confidence in one's abilities and in the effectiveness of one's efforts. Helplessness, on the other hand, relates to perceived inadequacy on several levels:

> People can give up trying because they lack a sense of efficacy in achieving the required behavior, or they may be assured of their capabilities, but give up trying because they expect their behavior to have no effect on an unresponsive environment. (Bandura 1977, 204–5)

Competence

Competence in the traditional parlance means knowing that what one can do matches what must be done (White 1959). In cognitive terms, this means being a good problem solver who (1) knows what to think, (2) knows what to do, (3) knows what to expect, and (4) does not feel the fool for trying (Kaplan 1989).

Knowing what to think implies that one has enough mastery of information about a problem to be able to break it down or to fit it into a different context that suggests alternative approaches. In other words, one's cognitive map is such that one can begin to play with ideas, to manipulate the problem, to say, "Well, what if we look at it this way?"

Often lack of involvement in environmental action results from people *not knowing what to do*. Having such knowledge and being able to assess the wisdom and effectiveness of those actions comprise an evaluating aspect of competence. The fit between the scale at which one addresses the issue must fit the resources that one can bring to it. Part of the success of barn-raising efforts, for example, hinges on how effectively people's skills are matched with the various tasks to be done (Williams 1986).

Knowing what to expect involves having a comprehensive enough model that one can predict and plan. One sees options and pitfalls and can anticipate the battles worth fighting.

These first three aspects of competence require familiarity and experience, whereas the fourth, *not feeling the fool*, brings in a social component. On one hand, it relates to self-confidence—one feels confident enough about oneself and one's skill to be able to experiment, to perhaps fail, and to try again. At the same time, *not feeling the fool* relies on the feedback one receives. No one likes to appear stupid or ignorant, especially in front of others. A social or learning setting that is more failure tolerant and encourages experimentation supports such efforts (Carroll and Mack 1982). Likewise, this larger social context can elicit action. It is embarrassing, for example, to be the only one on the block who does not recycle (De Young 1988–89).

Imagery

Competency is concerned with the problem-solving skills and attitudes of an action-taking public. Imagery refers to the informational stuff that helps build the models for knowing what to think, to do and expect, and for not feeling stupid about it. As mentioned earlier, the way that this information is presented plays an integral role in how people make sense of their world. Although helplessness results in part from a negative evaluation of one's skills, imagery plays a major role:

> One of these [confusions] involves the relation of one's own competence, one's ability to influence the environment, to one's expectations about the future. If the possible futures one can envision are undesirable, and if there is no means one can think of to avoid them, one is afflicted with an insidious condition called helplessness. (Kaplan and Kaplan 1982, 112)

It is important to notice how powerful perceptions are. People do not need to have even experienced helplessness to feel it; they need only to have the expectation (Glass and Singer 1972). So, when people see issues as very grim, urgent, and overwhelmingly huge and complex, it is not surprising that their perceptions will verge on futility and hopelessness. On the other hand, coming to an understanding of an issue within the context of what to do and where to start may prove more empowering.

Stories: Age-Old Imagery

If people need imagery to build models of effective action, where do they turn for that imagery? The implicit draw of a "good story" nominates it as a powerful tool. Ong (1982) argues that, although writing has changed, how people communicate and the way they understand and respond to information has not. Having no other means of storing what they knew, people who depended on oral communication had to be able to keep it in their heads. Stories provided a structure for doing that. Ong and a number of educators (Sarbin 1986; Common 1986; Vitz 1990) maintain that the narrative story still offers a compelling way for people to share information.

What's in a Story?

Stories fit with how people make sense of their world. As the word *storyline* implies, stories have sequence and causality that give one a framework in which to fit facts and anticipate events. They have a beginning, a middle, and an end. One is promised some kind of resolution and closure. The facts in a story are selective. Given an understanding of cognitive limitations, it is not surprising that incidents, wishes, and sisters in traditional stories came in groups of three to seven. The storyteller would have had trouble remembering too many more!

Stories are typically at a "human scale" and embedded within a context. They "reduce reality to a smaller scale that mimics it and yet enables us to deal with it in some manageable way" (Common 1986). Nevertheless, stories are also generalizable. Just as people build maps from particulars, so stories offer concrete examples from which they can generalize.

A good story makes sense, but it is also engaging. Because one knows it will end, part of the fun of a story is the mystery and suspense entailed in getting there (Rabkin 1973). Mystery appeals to people's curiosity, the human drive to figure things out.

A good story emotionally involves the readers (or the listeners). It has something that they can care about or someone with whom they identify (Hidi and Baird 1986). One of Vitz's arguments for the use of narratives in moral education hinges on their ability to provide a context in which one can not only vicariously experience but attempt to resolve abstract moral conflicts. "Narratives allow us to stop talking about the moral life and to point to it instead. Actions have long been acknowledged as more important than words. In stories, literally (as in movies), or at least in the mind's eye, moral action can be seen" (Vitz 1990, 718). Such a process would be very useful in environmental issues as well, where a call for action requires an emotional, perhaps even moral, commitment.

The Success Story

How might educators use such an effective medium to convey successes? They already know that stories do a good job of conveying bad news. The characteristics described above are what draw people to the latest-breaking catastrophe, the unraveling of a mystery, or a horror story. Likewise, many of the good environmental "stories" dwell on failures, on where things went wrong. Americans saw in graphic detail the damage wrought by the Valdez oil spill and heard about the far-reaching impacts of the Chernobyl meltdown.

The point here, however, is that people also need imagery for what it means to succeed. Although there is emerging recognition that success stories can be a powerful counterpoint to the somber picture people typically receive of environmental issues (Monroe and Kaplan 1988; Hobson 1989; Kaplan 1990), educators have only begun to understand what constitutes a success story and how it functions in a classroom. For purposes of discussion here, a success story refers to the short vignette—the newspaper clip or magazine article—describing people's environmental efforts. Although much of the argument may apply to case studies, they are not included in the scope of this discussion. The final part of this article will suggest, from a cognitive perspective, three salient aspects of a good success story. These relate to the imagery and scale of the story and to the number of stories one has.

Success stories offer imagery at two levels. First, they provide examples with which people can begin to build models of alternative approaches and the contexts in which they work. This means that the stories have to be more than one-liners: "Activist Wins Court Battle," for example. Rather, one should finish with a sense of how the activist's perception of the problem precipitate his or her actions and what strategies and even setbacks were encountered. A short article, "The River Avenger," (Aeppel 1987) describes Ray Proffitt, a self-appointed river vigilante. Taking advantage of provisions allowing citizens to sue polluters and government officials, he has been dragging polluters of the Delaware River into court . . . and winning. The article not only describes his successes and failures but paints a vivid picture of this dashing "folk hero" with a profound commitment to the environment.

Second, a good success story includes imagery that engages one cognitively. The story need not spell out a success; often a description of a process or someone's efforts to move the system to make the difference can serve as useful positive imagery. What is important is that the examples be engaging enough so that the audience would remain interested and eager to know what happened or would want some followup. Often these

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stories describe how someone saw or defined a problem differently. That twist in interpretation allowed for an alternative approach. Soldier's Grove, for example, is a small Wisconsin community that was forced to move its central business district out of a floodplain (O'Meara 1987). Faced with a crisis, this community dared to try something different, and it worked. As part of the move, community leaders decided that at least one-half of the energy for each of the new buildings had to be solar. Not only was the business district now on "firm ground," but most of the businesses have seen substantial savings in their energy bills. Perhaps some of the most critical elements of these stories are their scale and focus. If the scope of the problem is too all encompassing, the issue may seem overwhelming. If it is too small, it may be dismissed. As pressing and urgent as many global issues are, they often seem too remote and complicated for one to have any hope of influencing them. Burch (1971, 162) notes that access to more information "lifts us from the trivia of our provincial lives to the wider world of alternative hopes, lifestyles and expectations. Yet, by lifting our eyes, we also increase our sense of powerlessness."

Issues that relate to one's own circumstances and needs are hard to ignore. Concerns that hit closer to home are more concrete, tend to demand action, and offer more tangible results. The NIMBY (not-in-my-backyard) response exemplifies people taking a stand, in part because they can relate to the issue at a scale that is meaningful, personal, and motivating (Freudenberg 1984).

Finally, people may need a number of success stories to begin to build models. Without a number of descriptions of small community experiments, for instance, the example of Soldier's Grove might seem an anomaly. One can construct any number of arguments for why it could not happen anywhere else. However, after reading or hearing several stories describing different approaches or after seeing a variety of communities come up with creative options, one begins to see patterns that are not so easily dismissed.

The Promise of Successes

Learning about environmental issues, their complexity, urgency, and importance is overwhelming. Typical responses offer little in terms of effective solutions or actions. On one hand, there may be denial that the problems are real and pressing. On the other, there may be a fatalism that nothing can be done.

In this article, I have argued that active participation in environmental issues depends on several factors: how one understands the issues, how competent one feels about doing something about them, and what kinds of imagery one has for what to do. I have used a cognitive framework to examine ways to generate concern and, at the same time, empower the learner. Certainly, helping students become effective problem solvers is essential. Equally important is the imagery with which they approach these issues.

Positive examples, or success stories, can set a tone that provides a refreshing change from the more typical doomsday warnings or edicts for appropriate action. Apparently, people need only hear about crises and the failed or feeble attempts at addressing them to feel helpless. If expectation can precipitate helplessness, might not exposure to the other spectrum, to examples of effective participation, enhance efficacy?

Success stories hold promise in terms of helping people build more adequate models about environmental problems and their roles in addressing them. While acknowledging environmental realities, these stories establish a norm for seeing those realities as challenges. Educators still must look carefully at the characteristics of a good success story and at the changes that can make it more effective. Educators must better understand how success stories work. They are intended to help people participate, not to assure that everything is okay or that someone else is fixing the problems. What, for example, is it about a good success story that builds a map for action taking rather than one of complacency?

Exploration has just begun on how to incorporate these stories into the classroom and on how to convince the media that good news can make a good story. In many respects, there is nothing to lose. At the very least, the stories will inform. It is not unreasonable to expect them to create an arena for sharing successes and supporting those who are willing to experiment with new alternatives. And educators can hope that their examples may inspire others to commit their energy to a more sustainable environmental future.

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CONVERTING "IT'S NO USE" INTO "HEY, THERE'S A LOT I CAN DO!" A MATRIX FOR ENVIRONMENTAL ACTION TAKING

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Abstract

Our efforts to teach students about environmental issues too often breed hopelessness and helplessness, neither of which empowers students to action. Analyzing examples and strategies of environmental action helps build imagery of the possible and may inspire students to follow suit. A matrix designed to uncover multiple avenues for influencing action will be presented.

The impressive sales of the new "how you can save the world" books indicate the growing awareness and concern for environment and natural resources. This interest is reflected in other evidence of changing public sympathies: more reporters cover environmental stories, more businesses are 'green,' and more students register for courses in environmental studies. Unfortunately for the students, the courses are all too often an overwhelming dose of what the problems are, how our comfortable lifestyle makes them worse, and how the complexity of the issues makes solving them difficult.

This is unfortunate, because as long as we continue to frame environmental issues in terms of the problems, greater student knowledge often leads to deeper student despair. "These problems are so huge, there's really nothing _I_ could do to solve them; why should we bother to try?" many comment as their new interest is flooded by the frustration of helplessness and hopelessness. Such emotions do little to empower people to action (Maier and Seligman 1976). Further, depression and despair often effectively snuff out the initial spark of interest (See End Note).

Recognizing that a "doom and gloom" message does not win many followers, some teachers and some textbooks have begun tossing in examples of successes and stories of "people making a difference." Other courses explore a case study in depth, following every twist and turn of environmental action taking. While these teaching strategies do not steer students toward hopelessness, neither do they help students understand the problem and possibilities so well that they can take action on their own. To be environmental action takers, students must grasp the situation with a sense that they can handle the problem; their familiarity must be great enough to allow them to explore avenues for various actions. This means they need more than facts or even heartwarming stories; they need a mental model of the problem and possible alternatives. Further, they need a mental model that they are so familiar with that they can move about with comfort and facility.

A Bit of Background

The process of building a mental map or model in learners heads is not easy or explicit. The amount of information necessary to give learners confidence in what they know varies. Certainly somewhere between the cursory sketch of a novice and the packed map of an expert constitutes the realm of adequacy, but that hardly limits the possibilities. Not only the amount, but also the presentation and structure of that information are critical during map-building. The following two clues about cognition, however, provide guidance.

1. We need examples. Mental models are constructed from repeated experiences and examples. From these examples we distill generalities and confirm previous impressions, adding a few new details where possible to improve our predictive accuracy. We can recognize a dog from having seen many different dogs. We can explain a food chain using any algae-eating fish, because we understand the basic framework of the concept--thanks to many examples in our head. A series of examples is necessary to build an understanding of a concept (Medin and Smith 1984, Kaplan and Kaplan 1982).

2. Mental models are made of landmarks and connections, or points and paths (Lynch 1960, Kaplan and Kaplan 1982). When building a map, we tend to use important or easily identifiable elements around which are clustered related elements. We carry a model in our heads about our solid waste stream, for example. Landmarks, such as our garbage can, garbage trucks, and landfills are connected with details about their efficiency, location, number, recyclables, cost, etc. Teachers can assist learners in building mental maps by pointing out what is important in the examples and how these elements connect. Having such a mental framework allows students to move, to test, to explore; they are less likely to be immobilized by helplessness.

Even having all the answers and understanding why they are important may not enable people to take action if they lack social support. We care about what other people are doing, and what they think of what we are doing. We are not keen to be too different, or different in an unacceptable way. Therefore, the cognitive map should be constructed in such a way that this social support is built in.

3. Since we need to know we are not alone, and that these new environmental behaviors are sanctioned by the leaders of our community (Rogers and Shoemaker 1971), the examples should highlight what people have done, especially normal people who take action and are respected rather than being considered eccentrics.

Consequently, we need to teach about the environmental problem, while at the same time empowering people with hopefulness by teaching about potential solutions. By analyzing a series of examples, organized to make clear the underlying structure and commonalities, students will begin to build their own cognitive map for solving environmental problems. Further, students are more likely to gain confidence in their ability to take some action if they also know that other ordinary people have successfully tackled these issues.

The Matrix

Over the last three years, my environmental studies classes have found the following exercise helpful for comparing examples and strategizing future actions. A matrix facilitates the comparison and discussion of examples.

Down the vertical axis of the matrix are four categories of environmental problem solvers -- those entities we think of as the parties who resolve environmental issues: individuals, environmental groups, government, and business/industry. Since these entities do not often take action on their own, but are prompted to action by other forces, the top of the matrix lists the same parties as motivators. In the 16 boxes are examples of actions taken by a motivator and targeted at a problem solver (see Table 1).

For example, when an individuals writes letters expressing their opinion to decision makers, they are acting in cell 3: "write letters." And if this action is prompted by a magazine article they read in an organization's magazine, they were affected by "provide information" in cell 5. Groups affect government agencies through lobbying, supporting policies, collecting data, building public opinion, speaking at a public hearing, and bringing lawsuit (cell 7). Governments affect groups through tax exempt status, contracts, grants, and regulations (cell 10). Filling in the matrix is a helpful introduction to this way of thinking about problem solving.

Using the Matrix

From an example of an environmental action, students distill the story into specific actions, mapping the strategy taken to produce that outcome. This exercise usually helps students realize that environmental problems are not solved by just one action or by just one party, but rather, that the solutions are a sequence of actions that snowball from one to another. Most environmental successes are amalgamations of much smaller actions; the very act of pulling apart a case makes evident these small but critical steps. As Karl Weick explains in his insightful essay, "Small Wins" (1984), since smaller problems are more easily solved, framing an environmental issue in pieces may provide an enormous psychological benefit. After an assignment to create a matrix on an issue of their choice, one student plainly stated, "Looking at the Action Matrix .... I am able to tell that all things are interconnected. Suddenly, the immensity of the problem is not so large after all."

Students may also discover some gaps in their matrix indicating actions that were not taken. Discussions of potential barriers and advantages to the actions they have identified help students think about what works, what does not, and why.

The categories or parties identified on the axes of the matrix also help students think about their role and expand it beyond merely an individual or member of a group. Since an ordinary person can also influence a government agency or a business, students can envision their actions reverberating across the matrix.

Student Comments

Examples of successes, analyzed within a framework that helps students identify actions that are effective, can be empowering. Enough relevant examples make it clear that people across this continent are actively engaged a host of projects dedicated to improving the environment.

Student comments collected over the years speak to this growing efficacy. Said one math major, "I no longer feel powerless in the face of combatting air pollution from cars. The battle still looks difficult, but not impossible. The chart also made me think of a number of other issues on which I could have a larger impact than I previously thought possible." A particularly quiet student wrote, "When constructed to fit the preceding matrix, it is apparent that there are many ways in which to tackle the problem of aerosol products."

Positive attitudes are more common after this assignment, and the connections between the Problem Solvers and the Motivators are easier to understand. One student was reminded of the power that citizens possess for influencing government and business/industry as voters and consumers. "Both of these roles allow the individual to vote in favor of whatever he/she supports. ... Each form is a powerful weapon and tool that is often overlooked or forgotten."

Summary

This simple matrix is a tool for analyzing environmental actions. By focusing on examples of efforts to resolve environmental issues, students can build a mental model of how environmental problems are solved. Their analysis of these concrete actions can help students approach environmental problems with an idea of what others have tried. Communicating what others have done may help build an acceptable new social norm for environmental action.

End Note

The reformulated helplessness model (Abramson et al. 1978) holds that how the individual attributes the source of the problem or success influences helplessness. Depressives tend to attribute bad events to internal (not other people), stable (not temporary) and global (not situational) causes (Peterson and Seligman 1987). Since our instruction of environmental issues tends to teach that these stable, global, plentiful and pervasive problems are caused by individuals, it is not a surprise that students find environmental problems depressing.

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Table 1: The Action Matrix

Problem Solvers	Motivators Individuals	Groups	Government	Business
Individuals	Educate yourself Change lifestyle Letters to the newspaper Teach and talk to others Participate 1	Provide information Persuade Advertise Create educational materials 5	Regulate Tax Provide incentives Provide info Create educational materials 9	Provide jobs Advertise Make and limit options Create educational materials 13
Groups	Join Write letters Give money Elect leaders Become a leader Influence their agenda 2	Build coalitions Persuade Inform people Create networks 6	Research Lobby Regulate Give grants Tax status 10	Research Donations & Grants Provide jobs Endorsements 14
Government	Vote Write letters Run for office Raise funds Speak at public hearings 3	Research Monitor Lobby Bring lawsuits Endorse Speak at public hearings 7	Make appointments Give grants Charge fees Provide checks & balances Implement regs 11	Provide jobs File lawsuits Lobby Give money Advertise PACs 15
Business & Industry	Buy product Boycott product Write letters Buy stock Invest Report violations Draw media attention 4	Collect data Survey File lawsuit Lead boycott Create incentives Provide info Monitor 8	Create incentives File lawsuit Fine Regulate License Contract Zone 12	Compete with price Compete with quality File lawsuit Advertise Share technology Cooperate 16

MODELS AND APPROACHES : PART 3

EDITORS' INTRODUCTION

An Action Research Approach to Environmental Problem Solving: William Stapp & Arjen Wals

The Action Research Community Problem Solving approach is based on the belief that students should play a role in planning their educational activities. They should have the opportunity to take responsible action. Through that effort, students learn about the problem, the action, and the process of problem solving. The process of researching an issue to come to a problem definition is considered an action and therefore referred to as "action research." Stapp and Wals maintain participants do not have to understand the problem thoroughly before implementing the plan of action, as long as there are opportunities in the plan to assess the outcome and make necessary changes. They refer to this problem solving process as the planning–observing–action–reflection spiral, which is repeated to produce new understanding and improved results. The goal is for students to alleviate the situation, not necessarily resolve it. The Action Research Community Problem Solving process allows teachers to integrate structured and unstructured approaches in community problem solving. The next section begins with Table 2:4, which summarizes the Stapp and Wals approach. Stapp and Wals then discuss the rationale and techniques for engaging in this type of problem solving process.

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Reprinted with permission of the North American Association for Environmental Education, Due for Publication in August 1994, Stapp, William B., and Arjen Wals. *An Action Research Approach to Environmental Problem-Solving* (Lisa Bardwell, Martha C. Monroe, and Margaret Tudor, eds.). Troy, OH: North American Association for Environmental Education, 1994.

TABLE 2:4 Summary of Stapp & Wals Environmental Issue Problem-Solving Approach

What Happens in the Classroom

Students begin by touring the school and neighborhood to select a problem they wish to impact. They research the topic, set problem objectives, and analyze the problem (who is affected, what created the problem, what is your power, how can it be used?) in small, cooperative groups. They use brainstorming techniques to determine alternate actions and define criteria for the project. They design an action plan and take action. Reflection on the success of their action leads them to revise original plans and repeat the process of plan–observe–act–reflect.

Assumptions about Problem Solving

Environmental issues have societal and environmental aspects and must be understood from both perspectives. A "full" investigation cannot occur before students begin to take action—the process of action and reflection yields additional information that enlarges the understanding of the problem. Students have the capacity to understand and take action; building their confidence and competence is a part of good education.

Learning

Skill building can occur prior to or during the process of problem solving. Teachers should assess student needs to determine if time must be set aside to deliberately build skills. Some skills will be acquired only during the process of problem solving. Emphasis is on group processing, communication, and leadership skills. Many forms of action are possible, including investigating an issue. The repetition of the plan–observe–act–reflect spiral allows students to discover other perspectives of the problem. This is an opportunity to "stay off solutions" and return to earlier phases of problem solving activity.

Teaching Strategies

The teacher is the facilitator of the process (not a commentator or director), a source of information, a coordinator of group activities and field trips. The teacher keeps a journal and log of activities. Team teaching is encouraged to provide additional and interdisciplinary perspectives and divergent views.

Students' Role and Involvement

Students develop confidence in their own abilities to speak, contribute to a group, and analyze information. Students grow with the realization that their interests are more important than the textbook or the teacher's. An entire class may be involved, with small groups working on different aspects of a problem, from several weeks to a semester.

Evaluation Strategies

Student reflection and self-assessment of growth are used, as well as an evaluation of the success of the action, teacher and student journals and logs, and reflections generated through personal and group evaluation.

AN ACTION RESEARCH APPROACH TO ENVIRONMENTAL PROBLEM SOLVING

William B. Stapp
Arjen E. J. Wals

Introduction

Halfway through the year at Lahser High School in Bloomfield Hills, Michigan, 10 juniors and seniors who have survived the first two rounds of projects are meeting for their experimental science class. Last week the students began the third set of projects by identifying areas of interest. Today they are giving each other feedback on their project ideas. Although instructors Dennis Travis and Greg Zogg played a significant role in the beginning, their input has become more subtle and individualized. Today, they are enjoying being observers.

"Now Katie," Mark says after a pause, "why would someone believe you, a high school junior, just because you say there is a garbage problem? Why would they just go out and start a program to recycle paper?" Katie is expecting the question and is ready with an answer.

"Because I will have data from similar projects. I will interview people in other school systems and offices that recycle material and purchase recycled things. If others have done it successfully, or can point out problems to avoid, how can they have excuses for sending ALL our garbage to the landfill?"

The class continues to review the other student projects, offering gentle advice and helpful ideas for each. Just before class ends, Greg asks the students to think about the session, guiding their thoughts to help them realize some of their new skills and abilities.

"We get more done in a day than before," Krissy notes, "it's like we have more energy for the work we are doing."

"Don't you think that's because we have chosen these projects?" offers Katie. "I know I didn't care very much for that barnyard pond project we started with. Now that I'm working on something I really want to change, I like this class a lot."

Other students quickly agree, but they also admit they'd have been lost without the help the instructors provided on that first project. The barnyard pond project had walked them through the process of identifying a problem, collecting information, considering alternative solutions, making recommendations, and at each step, reflecting and revising their plan. The goal wasn't so much to help the farm manager with his polluted pond as it was to help the students learn a process of problem solving they could repeat with their own projects. Equally important, the experi-

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> *ence forced them into groups and began to mold them from apathetic, independent teenagers to supportive partners. Today's interactions, for example, would have been more antagonistic and belligerent earlier in the term.*
>
> *Katie's recycling project is a good example of how the process works. At the beginning of a project cycle, students think of the issues they really care about. In discussions with the class, they toss out suggestions for projects and form groups of students with similar interests. By the second week, the group presents a more coherent plan for the investigation of the problem and a solution. The members of the group develop that initial plan into a written project proposal that describes the nature of the problem, their expected or hypothesized outcome, and a timeline and methods needed for their investigation. The students revisit the plans frequently, sometimes changing them dramatically as more information becomes available.*
>
> *Every Monday the students must provide an update to the entire class on their progress and outline their goals for the coming week. This is a time to solicit help and advice from their peers, learning from each other's successes and mistakes. During the week, each group meets with an instructor for a more intensive review of its project.*
>
> *Katie realizes after her investigation that her ideal solution isn't practical. She changes her goal and the project results in a report and presentation to the school board, which decided to establish a pilot recycling program the next year. Because these projects started with student ideals, each project is forever colored with student expectations, energy, and values. After all, it's their education.*

This chapter focuses on the process described here, Action Research and Community Problem Solving (AR&CPS). It is a well-rounded learning experience that allows teachers and students to work jointly towards the resolution of a problem of mutual concern. AR&CPS is an attempt to empower learners by involving them in planning and developing their own education and by letting them experience that action is possible, even on seemingly complicated tasks. It represents a systematic approach to learning that can equip learners with the experience and skills necessary to become confident and competent decision-makers in society.

We will discuss the two main components of AR&CPS: Action Research and Community Problem Solving, and provide a composite outline of an AR&CPS project in a formal education context. This composite outline is based on a variety of AR & CPS projects the University of Michigan's School of Natural Resources & Environment has facilitated at the elementary, middle, and high school level since 1985.

Action Research

Action Research in education has its beginnings in John Dewey's philosophy of reflective thinking (Dewey, 1963). Dewey criticized schools for separating thought from action and thinking from doing. He disliked the static curricula that characterized early twentieth century education with its rigid separation of the disciplines. Dewey emphasized that thought cannot be divorced from action. Therefore, school curricula should involve students in the real world with the aim of improving the community for everyone, "so that the future will be better than the past."

Action Research was first used, not in schools, but in social settings such as factories and housing projects. In the late 1930s and early 1940s, Kurt Lewin provided a concrete way to apply Dewey's philosophy by developing the methodology of Action Research. Lewin initially focused on the impacts of discrimination in the work place and the community (Lewin, 1946). Later, however, Lewin applied this approach to education when he worked with Stephen Corey of the Horace Mann-Lincoln Institute at Columbia University, to help teachers and teacher educators utilize Action Research in schools. In 1952 Corey spoke of the need for education to prepare citizens for a dramatically changing world. Education must change too, asserted Corey, but the changes should be developed within the schools by those individuals most directly affected.

> *...Our schools cannot keep up with the life they are supposed to sustain and improve unless teachers, pupils, supervisors, administrators, and school patrons continuously examine what they are doing. Singly and in groups, they must use their imaginations creatively and constructively to identify practices that must be changed to meet the needs and demands of modern life, courageously try out those practices that give better promise, and methodically and systematically give evidence to their worth. (Corey, 1953).*

Action Research developed into a methodology that addresses problems in society by linking theories of change with practical action. It is designed to promote critical thinking at every stage of the process. To obtain a clearer understanding of Action Research we will now look at three major themes that emerge from Lewin's writings: Commitment to Democratic Principles, Praxis, and the Action Research Spiral (Lewin, 1946).

Commitment to Democratic Principles

Lewin, a social scientist, was interested in improving people's working and living conditions. He believed strongly in democratic decision making, a more equitable distribution of power, and practical problems as a never-failing source of ideas and knowledge (Lewin, 1946). Rather than asking for "outside" expertise to resolve existing disputes, Lewin involved the affected target group itself in articulating, discussing, and acting on a particular problem. Action Research is based on the assumption that people who are most affected by a social situation ought to be the ones evaluating it as well as the ones empowered to take action to change it. In factories, workers "on the line" would be the central characters. In schools, teachers, students, administrators, and parents take center stage.

The Action Research approach stands in stark contrast to the notion of "leaving it to the experts," a common response to problems in our high-tech world. While experts often have a valuable perspective on a problem, they may not know the problem firsthand or live with the consequences of actions they implement. Action Research posits that the people who live with a particular condition are usually more qualified to identify the problems associated with it and develop solutions that reflect their needs.

Praxis

In Action Research, evaluation, reflection, and action occur concurrently in a process that has become known as praxis, the union of reflection and action. While participants are engaged in a problem solving process, they are continuously reflecting on their work and evaluating its effectiveness. The process itself is an active one wherein participants, through analysis, conceptualization, fact finding, planning, execution, and evaluation—and then a repeat of this whole circle of activities—become engaged in a spiral process of task resolution, marked by critical reflection and action.

Notably, the Action Research approach has strong parallels to the ideas of Brazilian philosopher Paulo Freire, who has written extensively about the need for praxis and "conscientization." Conscientization is the process that moves an individual toward human liberation through critical consciousness of his or her state of oppression. This ultimately causes an individual to act in an effort to change his or her sociopolitical environment. Freire (1970) captured the spirit and philosophy of Action Research when he wrote:

> *You never really understand an issue or know how to help resolve it until you involve yourself in the issue. Then you begin to understand it, to identify the principal parties and actors involved, and begin to realize how to change it.*

The Action Research Spiral

Action Research is carried out in a series of repeated steps that can be diagrammed as a spiral (Figure 2:8). The process begins when participants (such as a teacher or a class of students) decide to address problems that affect them. By exploring, discussing, and negotiating with each other, Action Research participants identify and isolate a problem for study. They then work to understand the problem, to recognize the possibilities for resolving it, to explore the opportunities for taking action, and to identify the potential constraints that may impede their efforts.

As participants begin to generate ideas, they enter the first loop of the spiral. They develop a plan (P) that will help them solve their problem, implement that plan (I), and evaluate its effectiveness (E). Evaluation of the plan leads to the development of another plan, which takes them into the second loop, and the spiral continues. (The acronym for this spiral of repeated steps is PIE.) Loops generate more loops until the problem is resolved to the satisfaction of the participants. Throughout this process, participants reflect upon their learning and the evolution of the project. By reflecting, they can incorporate new information into their action strategy to better address their problem or to adjust their plan to a changing situation. Note that the action research spiral can be used at the individual level and at the group level, while the scope of the issue at stake can vary as well. The action research spiral also provides a useful metaphor to illustrate the nonlinear nature of problem solving and to emphasize the need for simultaneous action and reflection throughout the problem solving process.

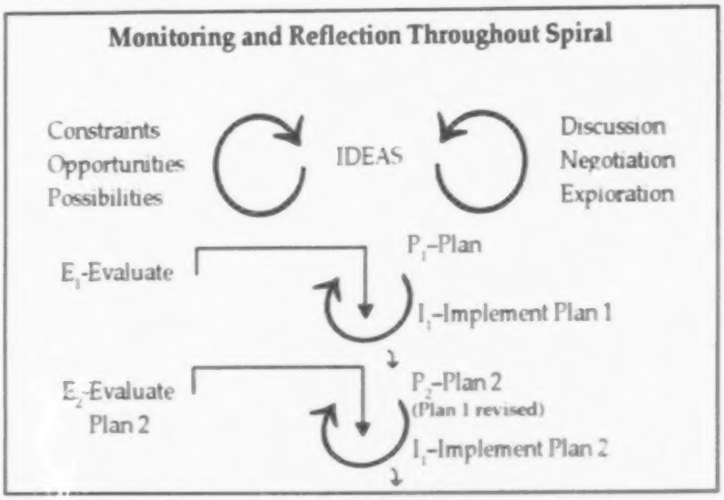
Monitoring and Reflection Throughout Spiral
Constraints
Opportunities
Possibilities
IDEAS
Discussion
Negotiation
Exploration
P_1–Plan
E_1-Evaluate
I_1–Implement Plan 1
E_2-Evaluate Plan 2
P_2–Plan 2
(Plan 1 revised)
I_1–Implement Plan 2

FIGURE 2:8 The Action Research Spiral

The utilization of Action Research in educational settings can take many forms (Carr, 1989). The focus of our work involves a melding of Action Research with Community Problem Solving in the context of environmental education.

Community Problem Solving

The Community Problem Solving component of AR&CPS has its origin in grassroots community organizing, efforts to help groups concerned about local problems and conditions to effect change. In the United States many community organizers have been trained at such places as the Highlander Center, and have in turn trained others. Today community organizing is a field in its own right.

In *Problem Solving: Concepts and methods for community organizations*, Brody (1982) covers the essentials for community organizers who work through the system. Major aspects of community problem solving and organizing that are critical to AR&CPS are explained below. In providing this information we draw on Brody's work.

The following are important elements of community problem solving: recognizing a problem; setting problem objectives; working in groups; collecting, organizing, and analyzing information; defining the problem from a variety of perspectives; identifying, considering, and selecting alternative actions to take; developing and carrying out a plan of action; coalition building; and evaluating the outcome and the entire process (Brody, 1982; Wals, Beringer, & Stapp, 1990). We will highlight some of these elements.

Defining the Problem

Brody points out that "a problem becomes a community problem when an individual's discontent becomes a broadly felt concern." Once that concern is expressed, it is important to define the problem. This is a critical step, for an ill-defined problem makes it difficult to focus on workable solutions and strategies to implement them. It is important not to define a problem in terms that suggest a solution, otherwise other solutions may not be considered. Once there is a narrow definition of the problem, it is very difficult to break out of that box to find other solutions.

To define a problem well there must first be an understanding of the background of the situation, which may require considerable probing. With this basic understanding it is then possible to write a problem statement with precision. General statements like, "Waste generation in the public schools is a problem" are valid expressions of concern, but are not helpful problem definitions, because the terms are ambiguous and solutions are difficult to generate. Problems should be stated clearly, such as "The use of Styrofoam in school cafeterias and the absence of in-school recycling contribute to the landfill problem in our community."

It is important to expand the definition to include answers to the basic questions: What is the problem? Where does it exist? Who is affected by it? When does it occur? To what degree is it felt? The next step then is to identify key factors affecting the problem, to focus on the problem area, and to assess the importance of the problem or part of the problem, and to analyze the potential for achieving an acceptable solution within a given time frame (what is working in our favor, or against us?). This way the community group is able to take into account the various dimensions of a problem.

Setting Problem Objectives

Once the problem has been well defined and priorities have been established, the next stage is to decide upon specific objectives. Objectives state exactly what your group wants to accomplish in a given period of time. If the problem is that a school does not accommodate recycling in the school building, then objectives could be to convince administrators, teachers and fellow students of the need for in-school recycling and to set up a system for collecting school waste that will facilitate the recycling of paper, cardboard, glass, aluminum, and toxins. It is important when setting problem objectives, that participants define potential successful outcomes of their project. Assessment of change is as important in setting community problem solving objectives as it is in setting business or educational objectives.

Working in Groups

This is a skill area that still appears to be underdeveloped in our society. Schools provide little training in working in groups and joint decision making so it is no surprise that community groups struggle with this. Individuals in the groups must learn to brainstorm effectively, to identify resources, to make decisions by consensus or voting, to recognize helpful and unhelpful group roles and behaviors, how to divide tasks among sub-groups, and how to implement change. These skills are so critical that participants may need to be trained to work together before they can begin addressing a community problem collaboratively.

Avoiding Pitfalls

Circular thinking makes it impossible to solve a problem and should be watched for and avoided. A good problem definition can help here. It is also important not to oversimplify a problem so as to avoid solutions that do not adequately address the problem. Another pitfall that groups sometimes fall into, which affects their credibility, is using analogies to prove that a problem exists, when only actual data are convincing. Another serious pitfall can be that the solution proposed is either too big or too small, and thus inappropriate to solving the problem. Not everything about problem solving can or should be rational. Sometimes we have to break out of the box to find a solution that works. Finally, the surest way for a group to fail in solving a community problem is to accept a palliative—an action that is not a real solution and addresses only the surface problem and not underlying causes. This is often referred to as the "band-aid approach." For instance, this is the case when a group is trying to solve the problem of street litter by organizing a street cleanup.

Coalition Building

Often one group by itself doesn't carry enough clout to give a problem the attention it deserves, let alone to solve it. Local environmentalists were upset about a proposed development in a park area in New York City. The group was unable to get the attention of city hall. But when it teamed up with a civil rights group and cast the issue as rich white folks trying to deny African Americans access to park areas, the city took notice and the combined groups were able to help solve the problem. Successful problem solving often involves finding where your group's interests intersect those of other groups and individuals who have political power or who by teaming together can draw more attention by sheer numbers.

Problem Analysis

To plan effective solutions and the strategies to get them implemented, there must be a good underlying problem analysis. Answers to the following questions must be found: Who are the actors in this problem arena? Who is affected and in what way? Who is responsible for creating the problem? Who has power to correct it? Who might be against your solution and how might you answer their arguments? What is your power in this situation and how can it be used? Problem analysis helps groups plan effective problem solving strategies.

Designing an Action Plan

A good action plan names, defines, and documents the problem. It presents an analysis of causes, the situation as it is now, and the costs of continuing this way. It suggests alternative solutions and the costs of each along with the benefits, and a recommendation of one solution with a rationale. The action plan also breaks up the effort to solve the problem into concrete tasks, each with its own time line and person or persons responsible for accomplishing that task. Goals and objectives are set and priorities are also decided upon.

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Having presented some of the theoretical foundations that helped shape our approach to environmental problem solving in schools, we will now turn to the model itself. We should note that the word "model" may be inappropriate here, since it suggests that it is a set of rules and guidelines that can be copied universally. This notion undermines our philosophy which holds that members of the school community should be allowed to play an essential role in developing, implementing, evaluating, and re-developing their own so-called models.

The Synthesis:
Action Research & Community Problem Solving

Students are sometimes dissatisfied with their education and unmotivated in the classroom because they feel that what they learn is removed from, and not useful or valid in, the "real world" (Everhart, 1983). The AR&CPS approach attempts to avert this discrepancy by addressing problems that students are confronted with on a daily basis. It is no surprise that during the AR&CPS process, institutional barriers to this kind of education often become a focus of attention. Teachers, students, administrators, and parents inevitably will be challenged by the institutional constraints that need to be changed for schools to be more responsive to education that is of an interdisciplinary nature, involves the use of community resources, transforms the teacher-student relationship, and leads to action taking.

Through AR&CPS, students' own experience and perception of the world become the focal point of their education. By synthesizing action research and community problem solving we have arrived at a learning process that enables students and teachers to participate more fully in the planning, implementing, and evaluating of educational activities aimed at resolving an environmental issue that the learners have identified. Note that the meaning of the construct "environmental issue" depends on the perceptions and the experiences of the learner as well as on the context in which education takes place. The term "environment" thus is broadly defined to include political, social, economic, and bio/physical aspects.

During the AR&CPS process, students are given responsibility in planning educational activities and are provided with the opportunity to take responsible action toward improving the quality of their community environment. Students become the practitioners of their own education when they take on the role of explorers, researchers, theorists, planners, and actors. They come to assume more responsibility for their own learning. The teacher becomes the guide and facilitator in this process and shares the role of learner when reflecting upon his or her own teaching practices and when learning about the issue in which the students immerse themselves.

Several presuppositions underlie this approach to education. First, it is crucial for society to solve critical issues with the full participation of its young members. Second, students need to know that they can be forces for constructive change and that their involvement is indeed needed in the world. Third, giving students a chance to investigate and act on a problem of their own choice will increase their motivation to learn. Last, the school and its community contain an abundance of rich material—of printed matter (newspapers, books, magazines), human resources (students, teachers, parents, institutions, organizations), equipment (chemical analysis kits, water monitoring devices, computers), for making education more meaningful to the students.

Basic Steps in Action Research and Community Problem Solving

In this section some basic steps or stages that can be distinguished in AR&CPS are described. These steps are presented here in a linear and logical order for clarity. It should be noted that the steps as outlined in this section do not necessarily occur as depicted. How teacher and students undertake these steps and in what sequence will vary with the individual and collective needs of all people involved in a project.

Planning the Process

Given the structure of schooling, it is quite a challenge to find a group of teachers and administrators who are willing to critically investigate their own educational practices and to develop their own curriculum. One of several ways to introduce the AR&CPS approach to a school is to organize a one-day workshop for teachers, administrators, and, when possible, students and parents. Ideally, in the spirit of action research, such a workshop would be initiated and facilitated by teachers and administrators within the school community, but schools may want to utilize support from outside resources as well (e.g., local teacher colleges, schools of education, and community groups).

The initial workshop should focus on questions like: What are some of the shortcomings in our educational program? How can we address them? How can we involve the students? and not on the question, What is AR&CPS? During discussion, some of the underlying principles and guiding assumptions of AR&CPS are likely to surface and can be adapted to the special needs and requirements of the school and its community. These consultation sessions will nurture a cooperative approach to the AR&CPS project and will help the teachers gain the support of the school's critical community (i.e., the principal, librarian, colleagues, parents).

Teachers working with AR&CPS need support from their colleagues as this approach to education involves the handing over of some of the control—sometimes obtained after a long struggle—of the classroom process to the students, working with an open-ended curriculum geared toward action taking, and evaluating the learners using journal entries and participation levels as guidelines. During the workshop the participants can discuss what kind of support they will need from administration, colleagues, and parents.

By the end of the workshop, a decision should be made whether and how to conduct an AR&CPS project. Teachers and administrators should select a class or classes in which to implement the project. If the class schedule lends itself to linking content areas (e.g., natural and social sciences), a team teaching approach across subjects and disciplines can be selected. Participants should also decide on a kind of support mechanism. One support mechanism could be to set up a regular meeting time where participating teachers can share their experiences with administration and colleague teachers. Such a meeting would give others within the school a better sense of what an AR&CPS project is all about, while it would provide the participating faculty with important support and feedback.

After the teacher(s) and school administrators agree to conduct an AR&CPS project, the students in the selected class are introduced to the project and asked whether they would be interested in participating. If so, parents are informed via the students and a letter from the teacher(s). The initial planning phase culminates with the teacher(s) establishing a tentative time line for the AR&CPS project. Teachers, administrators, and other interested parties may decide to set up an AR&CPS committee to guide the project.

Assessing Student Skills

At the onset and throughout the project, the teacher assesses the students' problem solving skills. If certain competencies are lacking, exercises can be done prior to and during the project to learn and refine these skills. A teacher could look at *group process skills* (e.g., the ability to listen with comprehension, to reduce "isms" such as racism and sexism, to provide constructive feedback, and to work toward group consensus), at information gathering skills (e.g., the ability to carry out a survey, to use a newspaper, to write a letter, to interview people, to find and contact agencies and organizations), and at more general problem-solving skills (e.g., the ability to work effectively as a member of a group; to recognize, identify, and state a problem; to generate, evaluate, and select alternative solutions; and to develop, implement, and evaluate a plan of action). Each of these skills can be enhanced through specific classroom activities (Bull et al., 1988).

Selecting a Topic

An AR&CPS project can begin with a walking and/or bus tour of the school and its neighborhood. The goal of this tour is to increase students' awareness of the natural and social environment of their community, which aids in exploring potential project topics. Students record issues of concern in individual notebooks. The neighborhood walk can be supplemented with a tour of the school building and grounds, where issues of student concern are also noted.

During the AR&CPS class sessions following the walk and/or bus tour(s), recorded topics are compiled through brainstorming environmental problems that students have become familiar with in their school, neighborhood, and community. The generation of topics can be done by small groups or by the class as a whole. The issues should be recorded in a class log book, which is to become a constant companion throughout the AR&CPS project.

The list of problems that appear on the board is often long and may address immediate as well as long-term concerns, local as well as global environmental issues. We already pointed out that in AR&CPS, the term "environment" is very broadly understood to encompass both the natural and social environment. For instance, in one of the AR&CPS projects conducted in Detroit, Michigan, students listed concerns which included abandoned houses that are used to sell crack, street gangs and related violence, lack of trees and flowers, litter on the streets, poor quality public housing, students being killed in car accidents on their way to school, and teenage pregnancy.

Once critical problems have been identified, the groups or class might cluster the topics and generate a set of criteria with which to narrow down their list. Urgency, critical nature of the problem, access to information, not too complex, and of interest to us have been criteria used by students in the past. These criteria help them discuss the various topics and decide which problem(s) to research. The outcome of this selection process may be one AR&CPS project for the entire class or several topics to be addressed in small groups (e.g., one to three projects with 6 to 7 students per group). This, too, is left to the students and teachers to decide collaboratively.

An AR&CPS project uses a class log book and individual student journals for written documentation of the learning process. The class log gives a detailed, technical daily account of the project and provides guidelines for further tasks, responsibilities, and research while the individual journals give students an outlet for their emotional response to their education, linking cognitive and affective learning and developing writing skills. Questions they might address include "How does being involved in this project affect me?" "How does this project affect my classmates and the teacher?" "What things do I like about the project?" "What things do I dislike about it?" and "How can we improve the project?" It is important that teachers also keep a journal addressing similar questions, but also questions related to changes they see occurring in their teaching and the school as an institution.

Researching the Topic

After the final topic(s) have been selected, the students research the topic in order to develop a problem statement that defines their project clearly. Parallel to the phases of community problem solving mentioned in the previous section—but not necessarily in the same order—students become engaged in defining the problem, setting problem objectives (project outcomes), group decision making, avoiding pitfalls, coalition building, problem analysis, designing a plan of action, and identifying and evaluating alternatives. In past AR&CPS projects, we have found that students, once a project topic has been selected, have a tendency to jump to quick ad hoc solutions. To avoid disappointment and find workable solutions, it is important that the students research the topic to gain a deeper understanding of the problem.

Throughout the project, the teacher serves as a facilitator; a source of information, a coordinator of group activities and field trips who provides, in conjunction with the administration and other teachers, materials the students want to use. In this research phase, students may work with newspaper articles; the school and public library; the yellow pages of the local telephone directory; a school computer; and human resources such as parents, administrators, other teachers, and local agencies. The information obtained is documented in the class log book and shared with all group members.

Determining Action

Once the students feel they have collected enough information about the problem under study, the AR&CPS project enters the action phase. While research continues, the project's action component, again, requires brainstorming a list of alternative strategies for addressing the problem, and establishing criteria with which to narrow down alternatives to one plan that students will implement to effect the change they desire.

A very important element of action phase is defining the outcome or "success" of the project. The nature of the problem outlines the potential scope of action and resolution. For instance, "it would be too pretentious to think that a group of students from inner city Detroit could solve the problem of drug abuse" (Wals & Stapp, 1989, p. 237). Therefore, it is crucial to discuss with students what is reasonably possible in the long and short run. In most situations the point is not that students completely resolve a problem (although this has been done), but that they take effective action to alleviate it.

Considering the action-reflection spiral (Figure 2:8), the action plan can be modified and refined until it meets the students' criteria of success. Again the individual journal becomes instrumental in providing students with an opportunity to articulate feelings of success and failure (Wals, 1989). Eventually, the consequences of the project are reported to all involved and interested parties: parents, teachers, the school, the community, and maybe the local press. The teachers themselves go through a similar process during which they articulate their own experiences with the project. Their written account of the project could include a description of how the project affected their teaching; their relationship with students, parents, and administrative personnel; and suggestions for further improvement of future AR&CPS projects including those pertaining to institutional change (creating team-teaching opportunities, modifying class schedules, considering alternative student assessment techniques, obtaining access to community resources, changing school policies, etc.).

Evaluation

Evaluation of the project is an ongoing element in all phases of AR&CPS. The log book, used to record achievements of past AR&CPS sessions and to write the agenda for coming project periods, gives a detailed account of the accomplished work. Individual journals serve as a medium for students to express their feelings and reactions to the AR&CPS process, which can help the teacher in modifying the project.

In addition, teachers periodically use other evaluative techniques such as "Plus, Minus, Change Sheets," which is a tool to get students to reflect on the things they like, dislike, and would change about the project. The teachers' documented observations can become the basis for a discussion on the strengths and shortcomings of the project with members of the AR&CPS support committee. These discussions with colleagues might result in additional constructive feedback (Bryant, 1988).

With regard to individual students' evaluation, the philosophy behind AR&CPS is founded on the belief that students will develop skills and become empowered as a result of their experience with the project. Empowerment here means that students, having been given responsibility for the planning of their own education and the opportunity to investigate and act upon an issue that concerns them, obtain the feeling that they can have an impact on decisions that affect their lives. Although one can have a false sense of empowerment, it seems that talent and knowledge go much further in solving problems if one has self-confidence. Students' verbal statements and written journal entries are instrumental in detecting feelings of empowerment or disempowerment and can help the teacher in readjusting the project and/or spending more time with a particular student.

As a day-to-day process, the growth and learning that occurs in AR&CPS cannot be measured with a grade on the culminating action alone. A student's contribution in all stages of the project should be considered in the evaluation. Teachers in past projects have used several criteria on which to base a grade including effort put into journal writing, quality of student reports, level of class participation, ability to work in a small group, quality of oral reports, and student self-evaluation. Although assigning a grade seems inevitable, most action-research-based approaches in education maintain that the purpose of evaluation is not to assess, judge, and compare students, but to give them feedback that stimulates further learning.

Conclusion

We have presented an alternative approach to education in the form of Action Research & Community Problem Solving. Action Research is the process wherein participants, through analysis, conceptualization, fact finding, planning, execution, and evaluation—and then a repetition of this whole cycle of activities—become engaged in a spiral process of task resolution, marked by critical reflection and action. Community Problem Solving can be defined as the process that helps groups concerned about local problems and conditions to become more effective in effecting change. Applied to the formal education system, the synthesis between the two results in a process that enables students and teachers to participate more fully in planning, implementing, and evaluating educational activities aimed at resolving an issue that the learners have identified. AR&CPS allows students' own ideas to be at the center of the curriculum. By acting on their own ideas, AR&CPS gives students the opportunity to realize that they can be forces of constructive change. Hereby, students learn that they can act responsibly and effectively rather than being acted upon. In its totality, AR&CPS affirms students' value in shaping a quality future.

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Four Steps to Evaluating Environmental Education Learning Experiences

DEAN B. BENNETT

ABSTRACT: The process of evaluating the effects of environmental education learning experiences on program participants involves knowing what evaluation is, its importance, obstacles to evaluation, and the role of educators and participants as evaluators. Program evaluation may be organized around four steps: step one—deciding what to evaluate, developing objectives, and allowing for intuitive and unanticipated outcomes; step two—determining the evaluation design and developing instruments; step three—collecting, analyzing, and interpreting data; and step four—reporting results and improving the educational program.

Evaluation is something we do every day—from looking in the mirror in the morning and judging our appearance to greeting a friend and eliciting a response about how he or she feels. We engage in it when we make most, if not all, our daily decisions—shall we go here rather than there? Is this or that a better buy?

In short, evaluation plays a key role in successful decisionmaking. And in education, as in so many professions, teachers make hundreds of decisions every day.

Unfortunately, evaluation in education is all too often considered a tacked-on chore, designed to satisfy some external entity that a program is worth the money. But, after directing statewide curriculum development programs for fourteen years, being evaluated by outside evaluators, and evaluating my own teaching and that of others throughout the United States, I'm convinced of the importance of, and need for, educational evaluation. Moreover, if we want to find a niche for environmental education in the curriculum, we cannot afford *not* to evaluate our programs. In fact, if we want to convince the educational community that environmental education can improve the curriculum and make it more relevant to students, we *must* evaluate our programs.

How can we effectively evaluate our environmental education programs? In this brief paper, I will set forth some basic steps that I believe will help environmental educators (and all educators for that matter) become better evaluators. In particular, I want to stress the following:

- Evaluation is a natural and integral part of good curriculum development and teaching
- Curriculum developers, teachers, and students are important evaluators of educational programs
- Evaluation is a way of improving how efficiently and effectively we plan, teach, and learn
- Evaluation is easy if approached with an open mind and common sense.

I define evaluation as a systematic method of judging the worth or value of an educational program. It is a method for finding answers to the following questions about a program:

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1. What happened?
2. How did it happen?
3. Under what conditions did it happen?

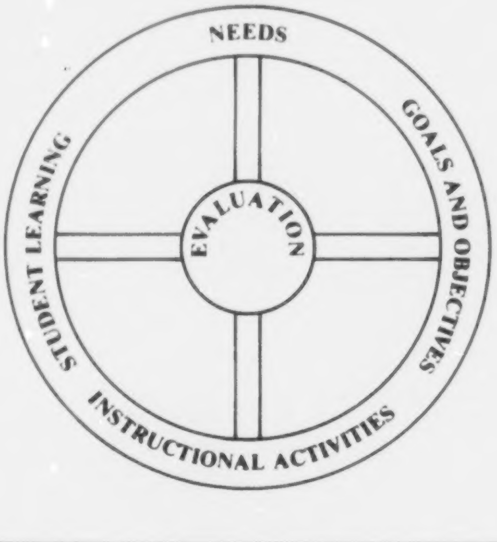
The "what" refers to the outcomes, the ends, or the products. The "how" is the process of planning, teaching, and learning—the methods and techniques used. "Conditions" refers to the context of the program—the setting, facilities, equipment, other instructional resources, and kind of support.

One way to visualize the role of evaluation is to picture a wheel with its rim representing the educational process as a cycle in which needs lead to goals and objectives from which instructional activities are developed and taught to produce student outcomes that meet the needs. The hub—evaluation—is connected to the rim by spokes, and its job is to keep the wheel moving properly, in good balance and proper alignment (see Figure 1).

There are four readily apparent benefits from evaluating a program. First, the information obtained will help improve the effectiveness and efficiency of teaching methods, the learning environment, and the use of instructional resources. Second, growth in student learning will more likely occur through better diagnosis of student needs and measurement of student achievement. Third, better assessment of the impact of educational programs on environmental protection will be possible. Fourth, educators will be in a better position to gain support for their programs from students, parents, administrators, and the general public.

Many, perhaps most, teachers think of evaluation in terms of deriving grades for student achievement. Its value as a tool for program improvement (the object of this paper) is often not given priority. Some obstacles are time, expense, fear of being evaluated, criticism of being too subjective, and complexity.

FIGURE 1.—Evaluation and the Educational Process



Time is perhaps the greatest obstacle. The secret to overcoming this constraint is to treat evaluation as an integral part of the total planning and teaching process, adopting the attitude that improvement is an ongoing need.

Expense is primarily a factor when an outside evaluator is retained. Admittedly, outside evaluators are sometimes desirable, particularly when seeking outside funding. The focus here, however, is on teachers and program participants as evaluators.

One criticism encountered with internal evaluations is the influence of subjectivity. But if educators openly invite inspection and review, seek opinions and reactions from participants, administrators, and the community, and report findings honestly, they can do much to overcome this criticism.

Fear associated with being judged and held accountable can also become an obstacle to evaluation. This can be reduced by giving participants a role in program planning, making clear the purposes of evaluation, and respecting the rights of participants with regard to access and release of information, including ensuring anonymity.

The perception that evaluation is complex, fraught with complicated mathematics, and difficult to understand can create an avoidance reaction. The purpose of this paper is to help simplify the process and take some of the mystery out of it. To do this, the process of evaluation is described as consisting of the following four steps:

1. Set expectations.
2. Plan the evaluation.
3. Determine results.
4. Use the results.[1]

Step One: Set Expectations

Key questions for educators include the following: What do you want to happen as a result of the program? For example, what outcomes do you have in mind? In short, what are your objectives?

Expectations should start with a goal. An example from the *Belgrade Charter: A Global Framework for EE* states: "The goal of environmental education is: to develop a world population that is aware of and concerned about the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively towards solution of current problems and prevention of new ones."[2] Such a goal has a long-range, direction-setting focus, and because it lacks the detail needed for measurability, it is usually translated into more specific outcomes called objectives.

There are at least two levels of objectives. General objectives are more specific in their outcomes than are goals and are written in terms that allow for subjective interpretation of outcomes. The following is an example: To help students acquire an understanding of the ecological role of penguins in the environment.

Behavioral objectives (also called performance or instructional objectives) emphasize quantitative and more objectively measured outcomes. These are precise statements of how students should behave or perform or what they should be able *to do* as a result of a program in order to demonstrate that they have learned a concept, attitude, or skill. The following is an example: Given the components of a food web, the learner will correctly draw connecting lines to a position held by a penguin. Notice that evaluation is built in; the data to be collected is identified in the objective. Behavioral objectives can be written for (1) knowledge and understanding, (2) thinking skills, (3) values and attitudes, and (4) action skills.

Knowledge and Understanding Objectives

Knowledge refers to the ability to recall something from memory. Understanding, however, occurs at a higher cognitive level and involves comprehending the meaning of something and being able to explain it. Objectives in this category indicate the important facts, concepts, principles, and generalizations that students should know and understand. An example follows: Given a series of five slides of environmental problems faced by penguins, seventy percent of the learners will correctly check the most probable cause of four of them.

Thinking Skills Objectives

According to the Tbilisi conference on environmental education, the problem-solving approach is probably the most distinguishing characteristic of environmental education. Such an approach requires the development of thinking skills. These include application, analysis, synthesis, and evaluation. There appears to be widespread agreement that cognitive skills progress in difficulty from knowledge to evaluation and that each skill requires the use of the skills below it; for example, application requires understanding which in turn requires knowledge.

Application is the ability to apply knowledge and new ideas to solving problems. An example of an objective is as follows: Given a set of guidelines on the art of testifying at public hearings, seventy-five percent of the students will receive a rating of at least eight on a ten-point scale assessing effectiveness during a mock hearing.

Analysis is the ability to break down ideas, objects, and events, including problems and issues, into their parts. In so doing, assumptions, causes, effects, reasons, and so on are revealed. The following is an example of such an objective: While reviewing statements both in support of and opposed to an environmental development, seventy-five percent of the students will be able to detect bias and faulty assumptions.

Synthesis is the ability to bring parts and elements together to form a unified whole. For example, after analyzing the causes of an environmental problem, a workable solution might be created. Here is an example of an objective: Given an understanding of the elements of good design, seventy-five percent of the students will create a plan, meeting minimum criteria, for beautifying the school grounds.

Evaluation is the ability to judge the value of ideas, objects, and events using appropriate criteria. For example, identifying an environmental problem, such as the severity of a water pollution problem, may require the evaluation of data from a water monitoring program. An example of an objective is as follows: Given criteria for judging the suitability of soil for a given land use, seventy-five percent of the students will be able to evaluate the compatibility of the land use.

Values and Attitudes Objectives

Without question, the values we hold play a central role in environmental problems. In fact, we may define "issues" as conflicts in values. Values, as defined here, relate to the ways that we judge the worth of things. As such, they are so powerful that they have a pervasive influence over our lives and guide our actions. For our purpose, values are thought to derive from attitudes. Attitudes, like values, reflect our feelings toward objects, both tangible and intangible, and include a wide range of emotions that influence the extent to which we value something. For example, dislike and fear of toxic chemical waste are attitudes that can strengthen the value we place on a clean environment.

Measuring attitudes and values is the most difficult task in evaluation because they cannot be measured directly. For example, a student may *say* that he or she values the conservation of scarce energy resources but may in reality be unwilling to change an energy-wasting lifestyle. How can a teacher determine the student's real value orientation? The fact is, there is no foolproof method. But most evaluators agree that the greater the number of different approaches used to assess a given attitude or value, the greater the confidence in the information obtained. These include direct observation of student activities, examining artifacts such as diaries, pencil-and-paper tests, and observing students when they are not aware of being evaluated. The important thing is that students demonstrate their attitudes and values in situations free from outside influences. The following is an example of such an objective: As a result of a unit of instruction on wildlife, the number of books related to wildlife taken out of the library will increase by twenty-five percent.

Action Skills Objectives

One of environmental education's most distinguishing features is its problem-solving approach. Hungerford and Litherland identified six categories of environmental action: persuasion, consumerism, political action, legal action, eco-management, and interaction.[3] An example of such an objective follows: In a school presentation, the students will be able to persuasively argue the point of view of the class as determined by a survey conducted before and after the debate.

Allowing for Unanticipated Outcomes

A major criticism of behavioral objectives is their tendency to focus on achieving predetermined outcomes to the extent that there is no exploration of what else the students may have learned. It is not unreasonable to expect that some of the most important results in student learning are unanticipated. Most will agree that it is impossible to anticipate all outcomes, much less have the time to write objectives that cover all possibilities and test for them.

To allow for unanticipated outcomes, only a few objectives of highest priority should be written and evaluated. This will give room to search for other, sometimes more elusive and subtle but no less important, quantitative and qualitative changes in affective, cognitive, and action-skill development.

Intuitively Measured Outcomes

Another way to measure growth in student learning is to examine feelings and insights. Intuition is the sense of something not really evident. Is it important? There are those who will argue vigorously against the use of intuition in assessing program effectiveness. They say that it is not objective, that it is not based on "hard" data—information that is observable and measurable. But is everything we learn measurable? We all have feelings, and they often provide evidence that cannot be ignored. There are those who maintain that intuition does have its place and that it can be fruitfully examined. In fact, objectives can be developed to measure intuition. For example: Students will describe in writing their feelings about the program.

Not only can the feelings of students be probed, but those of parents, administrators, and other teachers can also. Interviews work well in collecting this kind of qualitative data, but other instruments, such as questionnaires, rating scales, diary entries, and written essays should also be considered. One final note: in one sense, this type of information can be quantified. For example, if ninety percent of the students said that they felt that a particular program was valuable, this data might be meaningful.

Step Two: Plan the Evaluation

Key questions for educators include the following: How will you design your evaluation? When will you collect information? What information will you seek? What instruments will you use? How will you record your data?

Evaluation Design

The evaluation design establishes the overall organization and timing of the evaluation in order to detect real changes that can be attributed to your program. A great many designs are available to the teacher. A few of the more common ones are presented below:

Post-test design for summative evaluation (see Figure 2). In this commonly used design, the teacher tests students at the completion of the program. This kind of test is known as a summative evaluation because it sums up what the student outcomes are at the end of the program.

Post-test design for formative and summative evaluation (see Figure 3). In this design, the teacher checks student progress periodically during the program and makes any necessary adjustments in the program along the way. This design utilizes formative evaluation methods, that is, testing is done during the formative stages of the program and the students' development.

Pre-post-test design for formative and summative evaluation (see Figure 4). A teacher sometimes gives a pre-test in order to find out where students are with respect to the program's objectives. This provides a benchmark for determining growth in learning when the results of the post-test are available.

Pre-post-test design with program and no-program students (see Figure 5). Other, more complex, designs involve comparing changes in students who participated in a program with changes in students not in the program. The design illustrated here allows the teacher to be more certain that the effects observed are a result of the program and not of something else.

Evaluation Instruments

A few general guidelines should be considered when developing or selecting evaluation instruments. First, the directions and questions should be clear. Second, the instruments should be easy to administer and score. Third, they should be valid and reliable. Validity simply means that a test measures what it is supposed to, such as a particular objective. Reliability refers to how consistently students respond to the questions. For example, clear, unambiguous questions should yield the same responses from students each time they encounter them, provided all students have the same level of knowledge.

A number of evaluation instruments are available for collecting information:

Pencil and paper tests. By and large the most popular evaluation instruments, pencil and paper tests are particularly well suited to measuring knowledge, understanding, and thinking skills, but they can also be used to measure values and attitudes. Some limitations include (1) the "guinea pig effect," or awareness of being tested,

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FIGURE 2.—Post-Test Design for Summative Evaluation

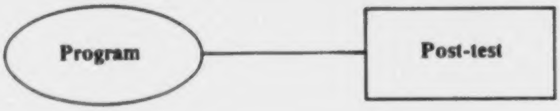


FIGURE 3.—Post-Test Design for Formative and Summative Evaluation

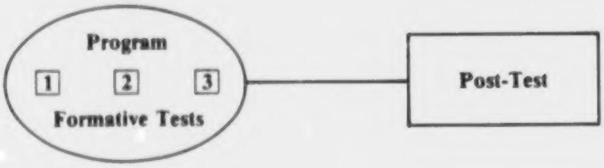


FIGURE 4.—Pre-Post-Test Design for Formative and Summative Evaluation

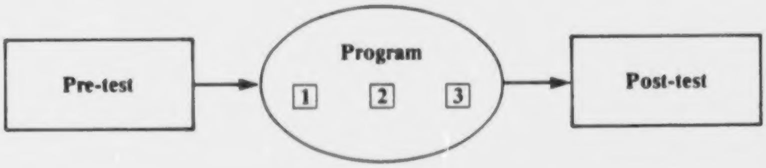
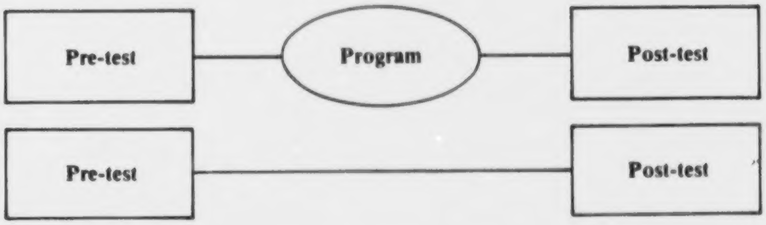


FIGURE 5.—Pre-Post-Test Design with Program and No-Program Groups



which may cause a respondent to answer in ways that he or she knows will please or defy the teacher; (2) lack of motivation; and (3) general emphasis on reading and writing skills, which may camouflage a variable being tested.

Performance tests of achievement. These are tests in which students are often asked to demonstrate an acquired manipulative skill. They provide an opportunity to approximate real situations and, because they usually involve directly measuring an outcome, little inference is required to determine its achievement. Performance tests, however, may be time-consuming to set up and administer.

Questionnaires. These pencil and paper tests are especially useful in measuring interests, opinions, and attitudes. With the right questions, they can provide participants with opportunities to give honest, meaningful input to the program. Questionnaires can be time-consuming and require careful pilot testing.

Interviews. Personally conducted interviews can have positive effects on the students' receptivity to an evaluation program. They give an opportunity to establish rapport and obtain frank and honest answers as well as detect bias and uncertainty. More complex questions can be asked and explained and responses probed and explored. This technique also works particularly well with very young children or those having difficulty with reading and writing skills.

Observational instruments. Observing the behavior of participants during a program can provide valuable data to supplement other measures. It is difficult, however, to obtain valid and reliable information this way because there will always be a degree of inference involved in translating behavior into cognitive and affective outcomes. Systematic observation involves using detailed checklists related to behavioral objectives and generally requires much practice. Informal observation is open-ended, involving note taking and summary statements, which may take the form of anecdotal records. Observational techniques also may use photography and video and audio taping.

Artifact examination. Students in environmental education programs frequently produce artifacts, such as reports, letters, posters, bulletin board displays, exhibits, and environmental improvement projects. Rating scales are often used to identify and evaluate such variables as evidence of effort, accuracy, completeness, and quality.

Unobtrusive measures. Sometimes students behave differently when they know they are being tested or observed. Unobtrusive measures, therefore, are designed so that students will be unaware that evaluative data are being collected. These measures are particularly useful for indirectly measuring attitudes and values. There are two kinds of unobtrusive measures: one involves observing activities in a normal setting, such as checking the use of a library after a particular lesson; the other involves observing students in contrived situations, such as planting litter along a field trip route to see how much will be picked up. These kinds of measures must be well thought out, however, so that students do not feel they have been tricked or that ethical principles have been violated. Such measures must also be well planned to avoid unexpected influences, because there is less control over the testing situation.

Instruments to detect unanticipated outcomes. Those measuring devices and techniques that provide opportunities to probe, explore, and search out information are the ones to use in seeking unanticipated or unexpected results of programs. Questionnaires and interviews with open-ended items are extremely useful. So is the case-study approach involving detailed descriptions of programs. Action-research approaches in which participants record and examine a program and its effects provide a valuable means of detecting unanticipated outcomes. These approaches encourage reflection, self-examination, and discussion.

Multiple measures. If possible, several instruments and techniques should be used to measure changes occurring as a result of a program. By using multiple measures, an evaluator can obtain a much broader data base for making judgments about outcomes in which he or she will have greater confidence.

Step Three: Determine Results

Key questions this step addresses include the following: How should you conduct your evaluation? Does the information show that you accomplished your objectives? Were there any anticipated outcomes? Did you intuitively perceive any outcomes not evident on paper? What problems and concerns arose?

Collecting Data

Before collecting data, it is important to become familiar with the instruments, to have all materials available, and to check the setting so that distractions, clues, and other potential problems can be eliminated. During data collection, the evaluator should be alert to disruptions and the comfort of participants, remain neutral, give directions clearly, and keep track of time. After data collection, incidents that might have influenced the results should be noted and the data organized for analysis.

Summarizing Data

After the data are collected, the next step is to summarize the information in figures. One way to do this is to find frequencies. A frequency is the number of times that something occurs in a given time or in a number of possibilities. Frequencies are often converted into percentages to provide a way of seeing more clearly the proportion of whatever is being measured to the whole.

Another common approach when faced with a range of scores, as might occur with test results, is to find a middle value, often called a measure of central tendency. Three commonly used measures of central tendency are the arithmetic average, or mean; the median, the midpoint between the two halves of a set of scores; and the mode, the value occurring most often. Of these, the mean is generally preferred. However, when there are extreme scores, the mean or mode is sometimes a better measure.

Measuring central tendency is often insufficient to adequately describe a set of data. The amount of spread or variation in scores should also be considered. This is expressed through the range, which is the high score minus the low score; the standard deviation, which indicates how widely the scores are spread around the mean; and the variance, which is the square of the standard deviation and is used in inferential statistics (see Figure 6).

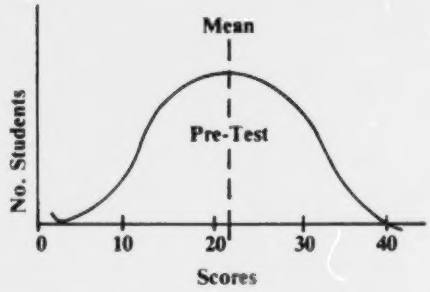
Data can also be summarized graphically. Examples include bar graphs or histograms, frequency polygons, and pie graphs (see Figure 7).

Information can also be analyzed utilizing inferential statistics to determine the probability that any changes that occurred are real and not due to chance errors and random fluctuations. However, many teachers are not experienced in using inferential statistics. This should not necessarily preclude drawing valid conclusions from data, however. When combined with intuition and common sense, descriptive statistics can provide much direction for improving programs.

Analyzing and Interpreting Data

Once the data are summarized, they must be analyzed in order to judge the extent to which objectives were achieved. When using test results as a means of improving a program, evaluators are generally interested in how the group as a whole does; for example, seventy percent of the students scored above eighty percent on a test. Comparing post-test results with those of a pre-test or the scores of other similar classes can help in making evaluative judgments.

FIGURE 6.—Spread or Variation of Scores



Before conclusions are drawn from data, one needs to be alert to possible sources of error, such as inappropriate objectives, unreliable and invalid test questions, and the effects of outside influences.

Step Four: Use the Results

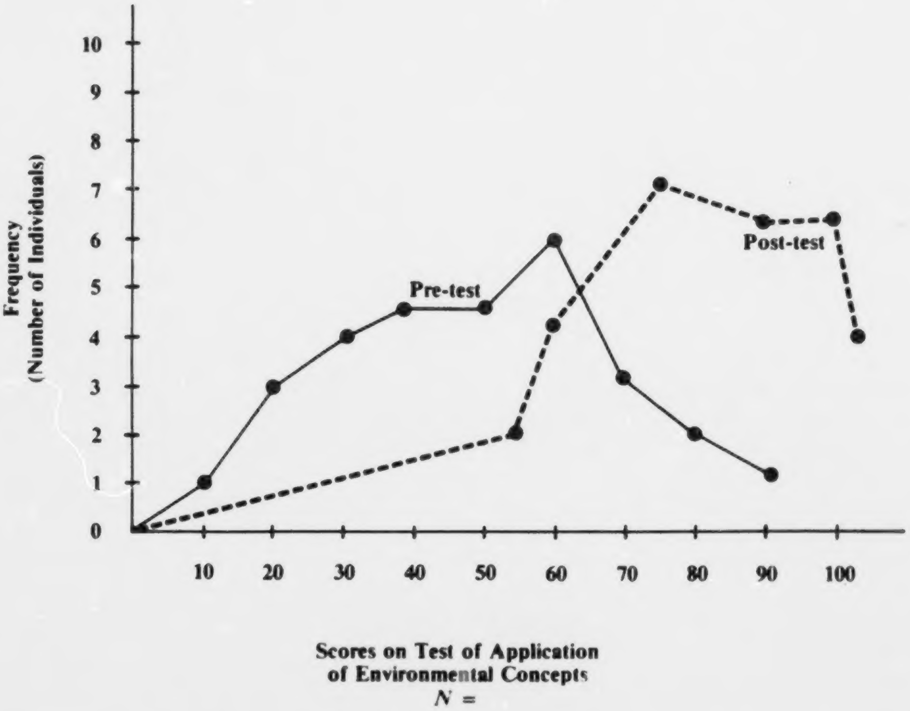
Key questions for educators include the following: Who should know the results? How will you report the results? What will you do to improve your program?

Reporting Results

Reporting the results of an evaluation is an essential step toward program improvement. Reports can inform others of a program's strengths and weaknesses, demonstrate a measure of accountability, generate confidence, garner support, organize information for program improvement, and provide feedback to participants.

There are many audiences for an evaluation report. They include students, school administrative personnel,

FIGURE 7.—Frequency Polygon



parents, interested citizens, other teachers, public agencies, and funding organizations. Special attention should be given to the rights of those evaluated when information is released.

In deciding what to report, each of the objectives and unanticipated outcomes should be addressed, including both positive and negative aspects. The extent to which objectives were met should be reported in clear and honest terms, presenting and explaining all supporting evidence and how it was obtained. Aspects of the program that will need to be changed, dropped, or kept should be described. Final statements of summary, conclusion, and recommendation usually complete a report. A report is only as useful as it is understandable; therefore, its organization, content, and presentation should be relevant to the purposes of the report, clear and to the point, and not so general that crucial points are missed.

Improving the Program

Ultimately the purpose of evaluation is to improve the program so that it will in turn yield greater returns for student learning about the environment. A first step is to examine recommendations in light of a program's rationale, goals, and objectives. Changes at these fundamental levels should be implemented first. All other improvements will necessarily relate to these.

Other major considerations for program improvement include the following: setting priorities; establishing timelines or schedules for implementing changes; and identifying major opportunities and constraints related to such factors as time, money, human resources, information, and materials and equipment.

NOTES

1. Much of this paper is based, with permission, on the author's book *Evaluating Environmental Education in Schools: A Practical Guide for Teachers*, published in Paris, France, by the Unesco-UNEP International Environmental Education Programme, Division of Science, Technical, and Environmental Education, 1984. The book is available in microfiche through ERIC Document Reproduction Service, 3900 Wheeler Avenue, Alexandria, VA 22304-5110.

2. UNESCO. 1976. *The Belgrade Charter: A Global Framework for Environmental Education*. Paris, France: Unesco.

3. Harold R. Hungerford and Ralph A. Litherland. *Environmental Action Modules*. Champaign, Ill.: Stipes Publishing Company.

New Trends in Education

4

MANY OF THE CURRENT TRENDS or reforms in education offer ideas that can enhance and support EE. In fact, EE has been an important contributing force for some of these current approaches, particularly interdisciplinary learning, and using real-world student projects to achieve learning goals.

The articles in this section add to the teaching techniques and approaches presented in the previous section. They may also help educators see the connections between EE and the larger educational reform movement. EE is not alone in taking a different approach to education.

Newmann, Fred M. "Linking Restructuring to Authentic Student Achievement," *Phi Delta Kappan* 72:6, February 1991, pp. 458–463.

Educational systems should be restructured to emphasize authentic achievement, says Newmann. This approach stresses the learning process—producing information—rather than memorization of specific content. Collaboration between teachers and students will "produce knowledge that has value in their lives beyond simply proving their competence in school." This type of achievement is assessed through projects in which students create personally and socially valuable information. This is applicable to evaluation of EE programs that encourage student participation in issues.

Willis, Scott. "Interdisciplinary Learning: Movement to Link the Disciplines Gains Momentum," *ASCD Curriculum Update*, November 1992, pp. 1–8.

Willis describes a current trend toward interdisciplinary teaching—linking traditional subject areas. This article gives several examples of interdisciplinary curricula, discusses how to choose interdisciplinary themes, and presents pros and cons of interdisciplinary teaching; two of the advantages are that it mirrors real-world situations and captures student interest.

Slavin, Robert E. "Cooperative Learning and the Cooperative School," *Educational Leadership* 45:3, November 1987, pp. 7–13.

Robert Slavin, a major researcher and proponent of cooperative learning, explains how and why cooperative learning works in the classroom: small groups of students with diverse learning styles and abilities, working toward a common goal, perform and learn better than individual students working towards individual goals. Cooperative learning techniques are especially applicable to EE, as environmental problems are, by nature, problems which affect many and require diverse inputs for effective working plans.

Gardner, Howard and Thomas Hatch. "Multiple Intelligences Go to School: Educational Implications of the Theory of Multiple Intelligences," *Educational Researcher* 18:8, November 1989, pp. 4–9.

Multiple intelligence theory contends that there are seven intelligences: logical-mathematical, linguistic, musical, spatial, bodily-kinesthetic, interpersonal, and intrapersonal. However, only the first two are regularly emphasized and tested for in schools. By recognizing the validity of multiple intelligences, we can broaden our teaching methods and content to create new approaches to assessment. Acknowledging distinctive talents and strengths in each individual is important in and of itself, but it may also be very important for the future in solving complex environmental issues.

Roth, Kathleen J. "Science Education: It's Not Enough To 'Do' or 'Relate,'" *American Educator* 13:4, Winter 1989, pp. 16–23.

In her discussion of three approaches to science education, Roth indicates that students do not always learn what the teacher intends when s/he 'uses' scientific and technological knowledge in school or in problem-solving; likewise, it is not enough to merely practice methods of scientific inquiry. For instance, Roth found that even the commonly taught concepts such as photosynthesis often left students with many misconceptions. To make sense of natural phenomena, students need well-connected conceptual frameworks. To help them develop these mental maps, teachers need to understand students' existing knowledge structures, identify misconceptions, and help students assimilate new information. Building a conceptual framework is a complex process that requires dialogue and "higher-order thinking."

Fensham, Peter J. "Science for All," *Educational Leadership* 44:4, December 1987/ January 1988, pp. 18–23.

Fensham, an Australian educator, explores some of the history of science curricula to emphasize the need for a new approach. He explains that traditional materials have emphasized conceptual structures geared towards those who would become researchers or scientists. This in effect discouraged many students from exploring science further. Fensham calls for an approach useful and available to everyone: science that has real world and everyday applications.

Lynch, Patrick J. "Teaching With Multimedia," *Syllabus*, April/May 1992, pp. 2–5.

Lack of familiarity with computer-based instructional materials keeps many of us from exploring this rich source of information and media. Lynch gives an overview of "multimedia" and suggests how to use it as a teaching tool. Topics that are difficult to teach may be well-suited for learning through multimedia. Likewise, getting assistance from fellow educators or consultants in the audiovisual or computer centers gives one the familiarity and confidence needed to start developing multimedia projects.

Linking Restructuring to Authentic Student Achievement

Unless plans for new structures are guided by a vision of educational outcomes that articulates new standards for student achievement and for teaching, restructuring is not apt to produce favorable results for students, Mr. Newmann warns.

BY FRED M. NEWMANN

THE CALL to restructure education sends an ambiguous but serious message. The word *restructure* suggests that the system is so fundamentally flawed that such terms as *innovation* and *reform* aren't robust enough to describe the changes that are needed. But what exactly is the challenge that we face in restructuring? What needs to be changed, in what ways, and for what purposes?

The history of education in America has been punctuated repeatedly with powerful slogans that mobilize the energy of practitioners, researchers, and policy makers. Recent examples include "back to basics," "relevance," "community control," "cultural literacy," and "effective schools." Much of a slogan's appeal rests in its capacity to conjure up multiple meanings that can draw diverse constituencies together in a common cause. While a slogan galvanizes public opinion and focuses energy, thus offering new possibilities for action, its ambiguity brings the great risk that energy will be dissipated in scattered, even contradictory, directions.

Therefore, before committing ourselves to new structures, we should try hard to reach agreement on the nature of the sys-

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Reprinted with permission of Phi Delta Kappan, Due for Publication in August 1994, Newmann, Fred M. "Linking Restructuring to Authentic Student Achievement," *Phi Delta Kappan* 72:6, February 1991.

tem's failure. For without agreement on the nature of the illness and on the purpose of treatment, the pursuit of radical cures could do more harm than good for students.

Today, reformers tend to address two main issues. The most obvious is the large proportion of students, especially low-income students of color, who fail in school and score poorly on nationally standardized tests. Much of the rhetoric about national education goals reflects concern about this group. Another issue – less popular, but perhaps even more disturbing – is that even those who succeed in school and score well on conventional tests have not been educated to cope successfully with the demands of personal, vocational, and civic life in contemporary society.[1]

Is the point of restructuring to provide a better way of teaching the current curriculum to students who haven't learned it through the old structure? Or is restructuring to be a vehicle to fundamentally change what is taught and how it is taught to all students? These alternative aims for restructuring can reflect conflicting goals of education, and the goals held by those pursuing each aim may lead to the creation of very different types of educational environments. It may not be necessary to choose between these stark alternatives, but the tension must be recognized. It reflects a persistent historical debate about educational ends that has no simple resolution and that even the restructuring movement will not solve once and for all.

Regardless of one's position on the forms of competence that schools should promote and regardless of the fact that large proportions of parents and educators perceive the schools to be working well, there are at least two grounds for seriously entertaining the prospect of fundamental organizational change. First, teachers face the persistent difficulty of engaging students in serious academic work in schools as we know them. Except for a few highly motivated students, most young people complete school only as a ritual. This pervasive disengagement creates massive problems of crowd control for educators and wastes the time of students and staff members alike.

Second, we must recognize the unfortunate record of traditional efforts to teach a virtually limitless list of fragmented pieces of declarative knowledge – e.g., that the issue of slavery divided the U.S. in the 19th century or that squares have equal sides and 90-degree angles. This enterprise, pursued over the ages as the main task of formal schooling, now actually undermines education. When schools try simultaneously to keep up with the explosion of knowledge and to accommodate the host of social demands placed on them, they cannot possibly give students the opportunity to develop in-depth understanding and the capacity for higher-order thinking that are required for success beyond school. The problems of disengagement and of excessive emphasis on coverage are related, and they exact their most tragic toll on students who, because of low income, cultural background, or lack of social support, do not succeed in schools as they are currently organized.

One of the biggest mistakes we make is the order in which we design the components of the education system. First, we set up an organizational structure; next, we plan the curriculum to fit the structure; and finally, we choose criteria for student success. Not until this last step do we articulate in a concrete way the ultimate educational purpose of the system. But by this point the outcomes are largely predetermined by the organizational structures and curriculum. Thus it should not be surprising that schooling seems so dysfunctional.

Moreover, the restructuring movement is about to perpetuate this error, because it, too, is trying to design organizational structures before clarifying purposes and reaching consensus on the educational ends that organizational structures should serve. For example, most of the talk one hears about school-site management, career ladders for teachers, or schools of choice never mentions how these mechanisms will teach students to write about literature, to reason about scientific phenomena, or to learn important geographic facts.

There is no reason to believe that restructuring will produce favorable results for students unless plans for new structures are guided by a vision of educational outcomes that articulates new standards for student achievement and for teaching. In this article I hope to nudge restructuring in this direction. First, I propose *authentic* achievement as the primary goal for students. Then, I advocate the need for *substantive conversation* in teaching, a new standard that is necessary to promote authentic student achievement. Finally, I suggest particular structures for student work that can facilitate authentic achievement and substantive conversation.

AUTHENTIC ACHIEVEMENT INVOLVES THE CHALLENGE OF PRODUCING, RATHER THAN REPRODUCING, KNOWLEDGE.

AUTHENTIC ACHIEVEMENT

The kinds of skills required to earn school credits, good grades, and high scores on typical tests are often considered trivial, meaningless, and contrived – by both students and adults. In contrast, a "restructured" vision of the goals of education seeks to evaluate performance activities that are worthwhile, significant, and meaningful: in short, activities that are authentic.

What criteria help us to recognize authentic forms of academic achievement? Consider the achievements of successful adults – scientists, musicians, business entrepreneurs, politicians, craftspeople, attorneys, novelists, physicians, designers, and so on. What are the characteristics of their work that justify calling their accomplishments authentic rather than contrived and trivial? Can we identify key distinctions between these authentic accomplishments and the work that students complete in school?[2]

People in the diverse fields named above face the primary challenge of producing, rather than reproducing, knowledge. This knowledge is expressed through discourse, through the creation

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> ***Accomplishments should have intrinsic value beyond their value in assessing knowledge.***

of things, and through performances. We do not expect children to attain levels of competence comparable to those of skilled adults, but we do want students to develop in the same direction.

To progress on the journey toward adult competence, students should set their sights on authentic expressions of knowledge. That is, they must hone their skills through guided practice in producing original conversation and writing, through the repair and building of physical objects, through artistic and musical performance. The conventional curriculum asks students only to identify the discourse, things, and performances that others have produced – e.g., by recognizing the difference between verbs and nouns or between socialism and capitalism; by matching authors with their works; or by correctly labeling rocks and body parts. Certainly, the production of knowledge must be based on an understanding of prior knowledge, but the mere *re*production of that knowledge does not constitute authentic academic achievement.

A second defining feature of authentic academic achievement is its reliance on a particular type of cognitive work that can be described as "disciplined inquiry." Disciplined inquiry, in turn, seems to consist of three features: 1) use of a prior knowledge base, 2) in-depth understanding rather than superficial awareness, and 3) production of knowledge in an integrated (rather than fragmented) form. In highlighting these features, I am not suggesting that students should be expected to make seminal contributions to the academic disciplines, to the professions, or to the arts. However, I am suggesting that students are quite capable of engaging in these forms of cognitive work when they are adapted to the students' levels of development.

1. *Prior knowledge base.* For new knowledge to be significant and valid, it must be based on substantive and procedural knowledge that has been accumulated previously by workers in the field, who establish facts, vocabularies, concepts, theories, algorithms, and conventions for the conduct and expression of inquiry. However, relying on a prior knowledge base does not always mean agreeing with intellectual traditions or continuing to develop them in a linear fashion. The ultimate point of disciplined inquiry is to move beyond existing knowledge – through criticism and the development of new models that are themselves stimulated by prior knowledge. Most of the cognitive work of schools consists of transmitting prior knowledge to students and asking them to reproduce it, rather than helping them to use it to produce new knowledge.

2. *In-depth understanding.* Disciplined inquiry tries to develop in-depth understanding of a problem, rather than only a passing familiarity with or exposure to pieces of knowledge. One masters prior knowledge not primarily to become superficially knowledgeable about a broad range of topics, but in order to develop complex understanding of a smaller number of issues. Such detailed understanding is particularly necessary for the production of new knowledge. In contrast, many of the cognitive tasks of school ask students to show only superficial awareness of a vast number of topics.[3]

3. *Integration.* To produce knowledge, one must assemble and interpret information, formulate ideas, and make critiques that cannot be easily retrieved from the existing knowledge base. All these activities require the ability to organize, synthesize, and integrate information in new ways. Students are unlikely to succeed at such tasks unless they learn to look for, to test, and to create relationships among pieces of knowledge that otherwise appear unconnected.

The third and final distinction between authentic achievements and traditional school achievements is that authentic achievements have aesthetic, utilitarian, or personal value apart from their value in documenting the competence of the learner. Indeed, this distinction may be the most crucial. When people write letters, news articles, insurance claims, or poems; when they speak a foreign language; when they develop blueprints; when they create a painting, compose a piece of music, or build a stereo cabinet, they try to communicate ideas, to produce a product, or to make an impression on others beyond the simple demonstration that they are competent. Achievements of this sort have special value that is missing from tasks contrived only for the purpose of assessing knowledge, such as spelling quizzes, laboratory exercises, or typical final exams. In many cases, the cry for "relevance" is simply a less precise expression of the desire that accomplishments should have intrinsic value beyond their value as indicators of success in school.

To summarize, the idea of authentic achievement requires students to engage in disciplined inquiry to produce knowledge that has value in their lives beyond simply proving their competence in school. Mastery of this sort is unlikely to be demonstrated in familiar testing and grading exercises. Instead, such mastery is more often expressed in the completion of long-term projects that result in the creation of discourse, things, and performances of interest to students, their peers, and the public at large.

Why should we aim toward authentic achievement? I suggest at least two compelling reasons, which respond directly to the problems of the conventional curriculum that I mentioned earlier. First, participation in authentic tasks is more likely to motivate students and to sustain the hard work that learning requires. Because authentic work has value beyond the mere demonstration of competence in school and because it permits more comprehensive use of the mind, students will have a greater stake in authentic achievement. Second, authentic academic challenges are more likely to cultivate the higher-order thinking and problem-solving capacities that are useful both to individuals and to society. The mastery gained in school would then transfer more readily to life beyond school and thus increase the efficiency of our public investment in schooling.

To develop organizational structures consistent with this vision, educators will need to plan "backwards." Beginning with a conception of authentic achievement and of the specific projects that express it, they will need to select appropriate content within the subjects. They will also need to consider the kinds of human interaction – involving teachers, students, and others – that promote disciplined inquiry into the subject. Although I cannot address organizational needs for specific subjects in this article, one aspect of interaction seems critical to authentic achievement in many subjects. This is the need for substantive conversation in instruction, which constitutes a major departure from present practice.

SUBSTANTIVE CONVERSATION

When the curriculum is geared toward the goal of authentic achievement, new forms of teaching will be necessary. No longer will it be possible for students to succeed in school simply by listening to the teacher and responding to questions that can be answered in half a dozen words. To complete authentic projects, students will need to formulate and to ask questions, to explain themselves to peers and to adults, and to refine their ideas. While many authentic achievements require capacities other than verbal discourse (e.g., working with one's hands, making mathematical estimations, using aesthetic sensitivities), substantive conversation between the learner and some supportive resource – teacher, peer critic, or other knowledgeable authority – is usually necessary. I emphasize substantive conversation, not because it alone is sufficient to develop all forms of authentic achievement, but because it is usually critical for success in authentic tasks and because conversation is the primary medium through which teachers and students communicate.

Substantive conversation differs from conventional classroom talk, in which the teacher usually has only two purposes (aside from disciplinary ones) in speaking to students: to transmit an item of declarative knowledge (usually a definition or a fact) or to determine whether the student can reproduce that item.[4] The student's goal (assuming that he or she desires to cooperate) is to give the answer that the teacher has in mind. The teacher maintains control in that he or she knows, prior to the interaction, what pieces of knowledge must be communicated and what answers will be acceptable.

In a substantive conversation, the purpose of talking is quite different. Each person is trying to express a point of view (often in order to persuade the other), to understand why the other holds a particular viewpoint or interpretation, or to arrive at a solution to a problem that neither has previously solved. This last purpose is the most difficult to fulfill, but it is perhaps the most likely to render the work authentic.

In pursuing any of these ends, the teacher uses talk to integrate subject matter into the student's meaning system, and the student tries to understand how the teacher's messages might empower him or her in the world. In this sense, each is interested in what the other has to say, the course of the conversation is less predictable than in conventional classroom exchanges, and each participant has some sense of ownership. To fulfill these purposes, substantive conversation requires sustained, continuous talk between two or more people. In school as we know it, the two key participants are usually student and teacher, but students can also learn through conversations with their peers, with other adults, and perhaps with well-programmed computers. Teacher/student conversation should remain central. But to expand students' opportunities for expression and feedback, it will be necessary to rely substantially on and to support these other sources as well.

WHEN THE CURRICULUM IS GEARED TOWARD THE GOAL OF AUTHENTIC ACHIEVEMENT, NEW FORMS OF TEACHING WILL BE NECESSARY.

What is the connection between substantive conversation and authentic achievement? Begin with the definition: authentic achievement is expressed in discourse, things, and performances that make reasonably complete, integrated statements and that reflect students' production of in-depth knowledge. Then ask the question, How can we instruct students to make such statements? We can show them models of authentic accomplishments of others, and we can give them critical elements of declarative knowledge on which to build. But how will they learn to make their own statements? Substantive conversation is the key. It provides the crucible for practice, for seeking new knowledge that relates to the problem at hand, and for trial, feedback, and revision. In short, substantive conversation forces us to transform declarative knowledge into applied, integrated knowledge.

STRUCTURES THAT FACILITATE AUTHENTIC ACHIEVEMENT

The Council of Chief State School Officers divides restructuring into four main categories: school governance (including decentralized authority and school choice), reforming the nature and organization of curriculum and instruction, new professional roles for educators, and accountability (especially new methods of assessment and direct state intervention).[5]

This analysis applies most directly to curriculum, instruction, and accountability. But I believe that, unless the entire restructuring agenda focuses more closely on authentic student achievement and on substantive conversation to attain it, restructuring will produce at best only cosmetic changes in students' education.

Assuming a commitment to these goals, what structural conditions seem necessary to achieve them? The conditions I propose below are in no way exhaustive. They outline certain key conditions under which students would work, but they do not provide structures of school governance, detailed systems of assessment, or specific new structures for the professional development of teachers. My argument has implications for these areas as well, and I do support the need for providing teachers with working conditions that enable new forms of professional support. But my central concern here is the structure of the instructional environment.

At least four conditions seem essential for students to complete authentic accomplishments: collaboration, access to tools and resources, worker discretion or opportunity for ownership, and flexible use of time.

Collaboration. Achievements outside of school often depend on the opportunity to ask questions of, to receive feedback from, and to count on the help of others, including peers and authorities. In contrast, typical school activities require each student to work alone. Working together is often prohibited, because it is seen as a form of cheating. Of course, it is important for students to learn to work on their own and not become too dependent on others. But if opportunities to cooperate are consistently denied, students will not experience a critical process that adults, both expert and novice, consistently rely on for success.

Useful collaboration depends to a great extent on opportunities for substantive conversation, which itself requires special structural conditions. More time will be needed for teachers to communicate with individual students through sustained talk and writing and for students to talk with one another. Substantive conversation also entails major shifts in the roles of teachers and students. Teachers will function more as mentors and coaches, less as depositories of static knowledge to be reproduced. Students will function more as constructors and producers of knowledge. They will rely on teachers for help, but they will not be mere absorbers or consumers of everything the teacher says. Students will also have to take on the new roles of seeking help from and giving help to one another as they learn.

Access to tools and resources. When competent people complete significant accomplishments – e.g., writing books, designing buildings, composing music, or reaching collective bargaining agreements – they usually have made use of a variety of printed materials and such machines as telephones, computers, and laboratory equipment. The information they require is generally too vast and too rapidly updated to commit to memory. In medieval times, before the invention of the printing press, becoming educated required memorizing the contents of key manuscripts, because future access to them was unlikely. But today increasing specialization and the explosion of knowledge create a new challenge. Possession of prior knowledge is critical to disciplined inquiry, but it is now impossible to teach students all the relevant information they will need to complete authentic tasks. The new challenge is to teach students to use tools and resources to find the appropriate knowledge when they need it.

Discretion and ownership. Rather than always toiling within the confines of predetermined routines arbitrarily dictated by authorities, the creators of authentic work influence the conception, execution, and evaluation of the work itself. At a minimum this entails exercising some control over the pace and procedures of learning; over opportunities to ask questions and to study topics deemed important; and over constructing and producing knowledge in one's own language, rather than merely reproducing the language of others.

There are, of course, important limits on the extent to which students should control their learning of academic subjects. Certain facts, definitions, concepts, algorithms, and processes of verification must be assimilated according to the standards of the disciplinary fields. But for this kind of learning to be translated into authentic products, students must enjoy some autonomy and discretion in its application.

Flexible use of time. The significant achievements of disciplined inquiry often cannot be produced within rigidly specified time periods. Adults working to solve complicated problems, to compose effective discourse, or to design products are rarely forced to work within the rigid time constraints imposed on students, such as the 50-minute class or the two-hour examination.

Standard time schedules stem from bureaucratic procedures designed to manage masses of students and diverse course offerings. Since they have nothing to do with the time requirements of disciplined inquiry, they can reduce the authenticity of student achievement. Achievements in noninstructional tasks, such as journalistic writing, interior design, or medical care, do involve deadlines and time limits. But in such work the schedules tend to be determined more by the nature of the work than by the requirements of institutional management.

The four conditions outlined above

"I never said 'fusion in my bathtub.' I said, 'I've made a few gins in my bathtub.'"

WE MUST RESIST THE TENDENCY TO INSTITUTE ADMINISTRATIVE CHANGES DEVOID OF FRESH EDUCATIONAL VISION.

suggest at least the following changes in the structuring of students' work.

- To stimulate collaboration and the substantive conversation so crucial to it, more time must be allocated to individualized and small-group instruction.
- Students' access to knowledge must be enhanced by greater use of technology (telephones as well as computers) and by opportunities to learn from sources outside of school.
- Students need to exercise discretion and assume responsibility in the planning, execution, and evaluation of their work, which further underscores the need for individualized and small-group work along with assessment that accepts diverse ways of demonstrating competence.
- Instructional time should be organized to permit more sustained, long-term, and in-depth investigation, in contrast to the fixed time slots designed for survey coverage.
- Assessment tasks calling for the production of discourse, things, and performances will require new procedures and in some cases the participation of individuals who are not members of the school staff to evaluate student performance.

Instituting these changes will contribute to authentic achievement. But they alone cannot guarantee it, for ultimately the quality of student achievement will depend on the quality of conversation that students have with teachers and with one another. For years substantive conversation has been difficult to find in schools, but only partly because of structural constraints. Even if teachers were blessed with more time and much lighter teaching loads, I suspect that substantive conversation would still be rare, because the goals of authentic achievement and substantive conversation also presume major shifts in prevailing conceptions of education. Organizational changes alone will not modify long-standing conceptions of knowledge and deeply socialized habits of didactic teaching that direct most of our educational efforts toward inauthentic forms of mastery.

Just as plans for restructuring should begin with the conditions in which students learn, the next step is to consider the working conditions that teachers need in order to generate substantive conversation. Again, we must not expect organizational structures alone to transform teaching. However, given the complexities of the teaching task, we cannot emphasize enough the need to provide teachers and administrators with sufficient authority, time, and assistance to reflect critically on their practice, to experiment, to fail, and to try again. Beyond enabling teachers to increase the proportion of time they spend interacting with individual students and small groups, we must work to give teachers more opportunity to collaborate, and we must provide for regular, sustained professional development that focuses on the goals of substantive conversation and authentic achievement.

Experiences in restructuring to date reveal three obstacles that dramatize the need for this kind of support. First, teachers, parents, and students who have experienced only the conventional version of education – especially those who have been successful – cling tenaciously to it, even when they have the opportunity to make substantial changes. Faith in conventional practice is fortified by the large proportion of students who do succeed on conventional measures, both in school and beyond. Second, external pressures for district, state, and national accountability, coupled with the need for ways to determine admission to college, continue to sanctify mastery of declarative knowledge as the most important goal of schooling. Finally, the struggle to establish new collaborative roles for teachers is stressful and time consuming; it drains energy and leaves diminished personal resources for thinking about new forms of achievement and curriculum.

The history of education reform suggests that we have yet to see fundamental change on a grand scale.[6] We might argue that the contemporary sense of urgency and the scope of the current restructuring movement combine to offer a unique opportunity. But to avoid the costly mistakes of previous efforts, we must resist the tendency to institute administrative changes devoid of fresh educational vision. If we keep our sights on the targets of authentic student achievement and substantive instructional conversation, restructuring could form a new chapter in educational history – and one well worth the effort.

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1. Albert Shanker, "The End of the Traditional Model of Schooling – and a Proposal for Using Incentives to Restructure Our Public Schools," *Phi Delta Kappan*, January 1990, pp. 344-57.

2. This complicated matter involving controversial educational values has not yet received extensive scholarly attention. Yet it begs for interdisciplinary analysis of the relationship between formal attempts to educate and the ways that human competence is expressed in noneducational settings. The conception I propose here builds on Harold Berlak, ed., *Toward a New Science of Educational Testing and Assessment* (Albany: State University of New York Press, forthcoming); Fred M. Newmann and Doug Archbald, *Beyond Standardized Testing: Assessing Authentic Academic Achievement in the Secondary School* (Reston, Va.: National Association of Secondary School Principals, 1988); John Raven, "Toward a Model of Competence, Motivation, and Behavior and a Paradigm for Assessment," in Berlak, op. cit.; Lauren B. Resnick, "Learning In School and Out," *Educational Researcher*, December 1987, pp. 13-20; and Grant Wiggins, "A True Test: Toward More Authentic and Equitable Assessment," *Phi Delta Kappan*, May 1989, pp. 709-13.

3. A commitment to depth over coverage entails no retreat from liberal education into narrow forms of vocationalism, as some might expect. The effort to concentrate on complex understanding welcomes study of a wide variety of disciplines and paths to knowledge. Reducing the emphasis on superficial exposure implies no necessary narrowing of the curriculum as a whole.

4. This analysis is based in part on the work of Martin Nystrand and Adam Gamoran, "Student Engagement: When Recitation Becomes Conversation," in Hersholt Waxman and Herbert Walberg, eds., *Contemporary Research on Teaching* (Berkeley, Calif.: McCutchan, forthcoming).

5. *Success for All in a New Century: A Report by the Council of Chief State School Officers on Restructuring Education* (Washington, D.C.: Council of Chief State School Officers, 1989).

6. Larry Cuban, "Reforming Education, Again, Again, and Again," *Educational Researcher*, January/February 1990, pp. 3-13. K

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Interdisciplinary Learning

Movement to Link the Disciplines Gains Momentum

By Scott Willis

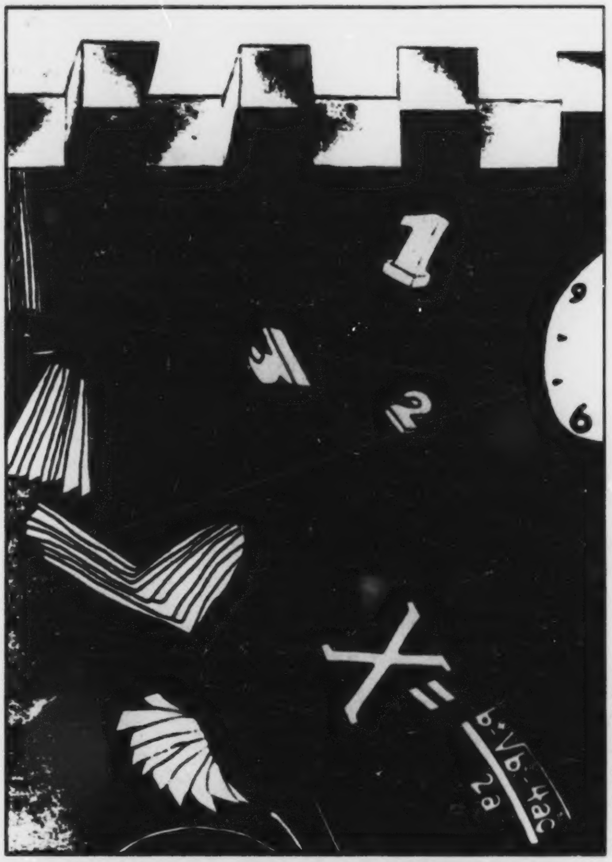
> **"Let's rethink the way we structure knowledge; it's been too rigid."**
>
> **—Heidi Hayes Jacobs—**

Four teachers at York High School in Yorktown, Va., decided last year to make some connections among their subjects—science, algebra, geography, and English—for their 9th grade students. Using a common planning period to collaborate, the teachers began modestly with an assignment to summarize earth science articles that strengthened students' knowledge of science as well as their writing skills.

Later in the year, the teachers launched an interdisciplinary project focused on the winter Olympics in Albertville, France. In small groups, students were presented with a problem related to one aspect of hosting the Olympics—providing transportation, food, lodging, entertainment, or security. The groups wrote proposals setting forth their solutions, drawing on what they had learned about the geography of the region and applying science knowledge and math skills.

In another effort to make the disciplines mutually reinforcing, Margie Williams, the English teacher, taught vocabulary that students would soon encounter in their algebra and earth science classes. "We knew it had to be beneficial for them to see [the vocabulary words] more than once" and in different contexts, she says. Her English instruction did not suffer, she adds—she actually taught *more* vocabulary than in the past. And when students came across the words again in other classes, "they felt good about being prepared."

These efforts at York High School reflect a growing interest among educators in providing instruction that cuts across the disciplines. Teachers throughout the country are exploring ways to transcend rigid discipline boundaries, observers say.



Photos by Christine Roberts

Unlike the school day, the world is not divided into discrete disciplines—a fact reflected in the student art featured in this issue.

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Interdisciplinary instruction mirrors the real world better than traditional instruction, advocates claim.

The trend toward interdisciplinary instruction is "a great movement on many, many fronts, including colleges, national organizations, and state education departments," says Heidi Hayes Jacobs, an education consultant and adjunct associate professor at Teachers College, Columbia University. A nationally recognized expert on the topic, Jacobs edited ASCD's *Interdisciplinary Curriculum: Design and Implementation*.

"Across the country you'll see an incredible increase in the the number of teachers who are bringing units of study together sensibly," she says. "It's very widespread."

In K–12 education, the most interdisciplinary activity is seen in the early grades—where "whole language" provides a vehicle for integrating the subject areas—and in middle schools, where teaming has a strong foothold, experts say. Far less is happening at the high school level, where the disciplines are more entrenched and teachers see themselves as subject-area specialists.

The ramifications of linking the disciplines are so far-reaching—with implications for curriculum, assessment, teachers' roles, and the structure of the school day—that Jacobs sees the ferment of activity as "a major restructuring phase in American education."

A Range of Approaches

Interdisciplinary instruction can take a variety of forms, experts say, from better coordination between disciplines to a total blending of them.

The simplest approach—sometimes called "parallel teaching"—leaves the disciplines intact but realigns content within them so that related topics are taught concurrently. For example, students read *The Diary of Anne Frank* in English class while they are studying the Holocaust in world history. Or they study statistics in math class while they are learning about demographics in social studies.

This approach offers a relatively easy way for teachers to begin linking the disciplines, Jacobs says. As a group, teachers scrutinize what they teach and when they teach it, looking for needless repetitions, gaps, and "natural" places for integration. Then they make adjustments so that topics are mutually reinforcing. "All the teachers need to be participating here," she recommends.

A more ambitious approach is for teachers—individually or in groups—to create interdisciplinary units organized around a theme, problem, or project. This approach requires a much greater investment of time by teachers, but the potential for making meaningful connections across disciplines is much richer, experts say. In this approach, discipline-based and interdisciplinary instruction co-exist.

The most sweeping approach—sometimes called "integrated" instruction—is to blend the disciplines entirely into thematic or problem-based pursuits. Instead of studying subjects, students might consider a question such as "Is war ever justified?" from the perspectives of history, literature, and science. In a fully integrated approach, "you're not quite sure what class you're in," says Pat Wasley, a senior researcher with the Coalition of Essential Schools.

Education consultant Susan Kovalik is an ardent advocate of this approach, which she calls "Integrated, Thematic Instruction" (ITI). In an integrated class, "you take the world the way it presents itself," she explains. Students take a place, event, or time and examine its environment, demographics, culture, and so on.

"You don't *ever* study things out of context," Kovalik emphasizes. Students still learn traditional content, she says, but they learn it in context, "used in a way in which it really exists." As a result, "kids never will say, 'Why do we have to do this?'"

Why Link the Disciplines?

Why does interdisciplinary instruction appeal to so many educators? Advocates claim it offers many advantages—first and foremost, that it mirrors the real world better than traditional, discipline-based instruction.

"The real world isn't divided into separate disciplines," says Suzanne Krogh, a professor of education at Western Washington University and author of *The Integrated Early Childhood Curriculum*. Young children are interested in the entire world around them, she says; it doesn't make sense to them to say "math" or "social studies." When instruction jumps from one discipline to another every 45 minutes, learning is fragmented unnecessarily.

Kovalik agrees. The disciplines are "contrived ways to give people information," she asserts. "The world operates as a whole."

In short, experts contend, the disciplines are artificial, and they splice learning into fragments that may never cohere. When students are taught solely through the disciplines, they believe that math is math, and social studies is social studies—and never the twain shall meet. The idea of applying mathematics to a social studies question, such as the changing demographics of cities, may never occur to them.

Interdisciplinary instruction, by contrast, "provides connections among subject areas so that students can better understand that their learning has application to real life, to real topics—that learning is not just isolated bits of fact in a vacuum," Krogh says.

"Setting aside people's notion of what kids need to go to college, why *would* you teach in disciplines?" asks Rick Lear, senior researcher for school design with the Coalition of Essential Schools. Although the disciplines have "intellectual coherence," they are not necessarily the best vehicle for teaching students about the world. "If they were, we'd have more kids who were interested in math and science, not daunted by it," he asserts. The disciplines can help us organize our thinking, but they should not be the focus of instruction, he believes.

The argument that teaching through the disciplines is efficient does not cut much ice with these experts. "Efficiency is dependent on effectiveness," Jacobs points out. In discipline-based instruction, the teacher "may very quickly get through material, but the kids may not have gotten anything out of it."

Wasley concurs that the disciplines are an efficient vehicle for coverage—not learning. Although discipline-based instruction has enabled teachers to plow through lots of content, "kids aren't coming out as competent human beings," she says.

A second major benefit of interdisciplinary instruction is its power to motivate students, experts say.

Interdisciplinary themes and projects capture students' interest, increasing their level of concentration, says Krogh. "Sometimes kids are really turned on by a particular theme," she notes. When that happens, "they're more inclined to learn the academic subject matter."

"The kids' attention seems to be riveted on these [interdisciplinary] activities," says Steve Schwartz, social studies supervisor at South Shore High School in Brooklyn, one of 20 high schools working with the American Forum for Global Education to deliver New York's 9th grade social studies curriculum in an interdisciplinary way. Students' attention is greater because "they know class A will impact class B and maybe class C," Schwartz says.

Also motivating is the higher reality quotient of interdisciplinary studies, experts say. Units organized around a problem, theme, or project generally present new information in the context of real-world applications. Students study fractions or research meiosis because a need for that knowledge has arisen—not because it might be useful at some vague future date.

"Kids are motivated by their perception of the relevance of a topic," Wasley says. "If they only do math in math class and never see any applicability, never engage in problems that serve a personal purpose, then they won't invest energy" in studying the subject. In discipline-based instruction, students often see no reason to take Algebra I except to take Algebra II, Lear notes.

Interdisciplinary instruction can also help teachers surmount the problem of the overcrowded curriculum, experts say.

"Interdisciplinary approaches offer a way of ranging over the disciplines without getting tangled in the maze of coverage," says David Perkins, co-director of Harvard's Project Zero. Through interdisciplinary instruction, teachers can "fold together perspectives from two or three disciplines" in the same lesson.

Interdisciplinary instruction can also help bring order out of the chaos caused by the "knowledge explosion," experts contend. Knowledge is growing rapidly, and schools can't just keep throwing more and more random facts at students, Jacobs points out. "Facts are like the chips in a mosaic," she says, and educators need to be very clear about the glue—the organizing principle—that's holding them all together. Interdisciplinary approaches can lend coherence to abundant facts by showing how they interrelate.

Yet another advantage of interdisciplinary instruction is the way it fosters collaboration among teachers.

"One of the strongest detriments to the professional growth of teachers is that they work in isolation," Wasley says. "Working together is a necessary benefit of doing integrative work." Teachers work closely together as they align the topics they teach or develop units that cut across disciplines. "In a thematic approach, the curriculum binds them together," she says.

When teachers collaborate to plan interdisciplinary instruction, "the process is almost as important as the product," says Joan Palmer, associate superintendent in the Howard County (Md.) Public Schools. Teachers who work together develop "a new understanding and respect for other content areas" and a "collaborative spirit," she says. The result is "positive networking throughout the school."

In Defense of the Disciplines

Not everyone finds these arguments for interdisciplinary instruction entirely compelling, however.

One expert who has reservations about them is Grant Wiggins, director of programs and research at the Center on Learning, Assessment, and School Structure (CLASS). While he sees value in making connections across disciplines and is not opposed to the growing interest in interdisciplinary instruction, Wiggins rejects the notion that discipline boundaries are harmful and arbitrary.

Units organized around a problem, theme, or project generally present new information in the context of real-world applications.

"I don't understand this penchant" for breaking down discipline boundaries, he says. The contention that the disciplines don't reflect real life sets up "a phony contrast," he believes, because there *are* disciplines that operate in the world outside school.

Wiggins also rejects the argument that interdisciplinary instruction is, in itself, more relevant and hence more motivating. "Any thoughtful approach to curriculum is going to make things more contextualized and interesting," including discipline-based approaches, he says. Citing the case study method used at Harvard Law School, which is closely tied to the real world yet subject-specific, he argues that better attention to content and context can make discipline-based instruction as relevant and motivating as integrated instruction is touted as being. Moreover, interdisciplinary approaches sometimes fail to motivate students, he notes. "I've seen thematic approaches that leave the student cold."

Wiggins also worries that interdisciplinary teaching tests the boundaries of teachers' knowledge, requiring them to wade into topics beyond their area of expertise. Such efforts can be "a fun adventure or pooled ignorance," he warns.

Wiggins worries that interdisciplinary instruction may require teachers to wade into topics beyond their area of expertise.

The idea of interdisciplinary instruction is popular, Wiggins believes, because "it's a seemingly plausible response to a real, perceivable problem: dreary teaching of subjects." What is needed is better teaching of subjects, including the finding of meaningful connections between them, he says.

How Is Learning Different?

Of course, the most fundamental question to consider in weighing the merits of interdisciplinary instruction is how it affects students' learning. Do students learn better when instruction cuts across disciplines—and, if so, how?

"We have known for a long time that students learn more, remember more, and apply knowledge more" when they are taught in an interdisciplinary mode, says Palmer. Students need to see the whole context of what they are learning, she believes. When they do, "they thoroughly

Choosing a Theme

Choosing a fruitful theme is critical to the success of an interdisciplinary unit, experts emphasize.

The theme or question chosen has to be broad enough that students can find an area of personal interest, says Pat Wasley of the Coalition of Essential Schools. "What is the relation between the elements in the garden?" will be a more productive question than something narrow, such as "What is soil?" A theme that is too broad, however, can be "a disaster," says Rick Lear, also of the Coalition, because, if everything fits into it, the theme becomes meaningless.

Education consultant Susan Kovalik suggests several criteria for choosing a good theme, in the form of questions teachers should ask themselves:

- What is so important about this theme that it will promote future learning?
- Does it have substance and application to the real world? ("Dinosaurs are dead," she notes, alluding to a popular theme.)
- Are relevant materials readily available?
- Is it meaningful and age-appropriate?
- Does it tie into other units, enabling students to make generalizations and have greater understanding? (Themes must relate to one another, she says. It is a mistake to think "You do fish for one month, then simple machines for one month." Themes should "flow" logically.)
- Is it worth the time needed to create and implement it?

Teachers need to guard against choosing themes that will "play well" with students but not yield much learning, warns David Perkins of Harvard's Project Zero. "Sometimes [units] are organized around trivial themes with no depth," he says. As an example, he cites the theme of "transportation," an arbitrary category that "doesn't boil down to much" as a means of integrating subject areas. "Evidence" is a better theme, he says, for several reasons:

- It applies broadly to a wide range of subject areas. The question, "How do we know what we know?" applies to all subjects.
- It discloses fundamental patterns. Discussion of "evidence" would lead to analytical concepts such as hypothesis, experiment, and deductive and inductive reasoning.
- It reveals contrasts and similarities. For example, evidence in math consists of logical reasoning; in science, experimentation; in literature, textual analysis and interpretation. Hypothesis and conjecture, however, operate in all subject areas.

Another important criterion of a good theme, Perkins adds, is that it fascinates students once they get immersed in it.

Students' reactions to themes can be difficult to predict, however. Six teachers at the Fryeburg Academy in Fryeburg, Maine, collaborated to develop units on evolution, power, discovery, and revolutions, says Jan Hastings, a music teacher at the school. When they taught the first unit, on evolution, the teachers were pleased. But "the kids hated it. They said, 'We don't want to hear about the same thing in every class.'" Hastings attributes students' resentment to the fact that they had never been asked to think about the same concept in every subject area before.

Suzanne Krogh of Western Washington University had an entire class reject her dinosaur unit. She cancelled it, despite the time and energy she had invested in preparing it. "The teacher has to be flexible and listen to what children are interested in," she says. Themes that capture young students' interest include marine ecology, the planetary system, and space exploration, she has found.

To avoid student apathy or rebellion, interdisciplinary themes should arise from students' own questions and concerns, says James Beane of the National College of Education in Evanston, Ill. Themes and related activities should be "planned from scratch with kids," he believes, by surveying students or brainstorming with them. Such an approach taps students' interests and empowers them as learners.

Those who believe adolescents' interests are trivial or self-centered are simply mistaken, Beane says. Students have "tremendous concerns about the larger world," including such issues as world peace, the economy, racism, and protecting the environment. "They're very concerned about

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understand; they're not just doing rote memorization."

Students' learning is richer when they are taught in an interdisciplinary mode because drawing connections between subjects requires students to do more higher-level thinking, says Ben Ebersole, a professor of education at the University of Maryland–Baltimore County and head of ASCD's Interdisciplinary Curriculum network. "You really have to understand things better to put them together," he says.

Interdisciplinary instruction yields more long-term learning, without sacrificing the basics, says Daniel Tanner of Rutgers University, co-editor of *Restructuring for an Interdisciplinary Curriculum*. Perkins "cautiously" agrees that an interdisciplinary approach could yield better retention, because the more "multiply connected" a piece of information is, the better it is remembered. He also believes that interdisciplinary approaches can foster more creativity and thoughtfulness.

Moreover, students gain two very important insights through interdisciplinary work, Perkins maintains. First, they learn how the disciplines can work in concert. "By and large, in conventional education, the disciplines are not shown to work together," he says, even though "many, many real-world endeavors" draw upon more than one discipline. Even within the professions, the boundaries between disciplines "are not as impermeable as they are in a typical school setting."

Second, students gain perspective on the disciplines: they get a broader view of the subject matter of each, and they learn "how it's done and what it's good for" in real life. This perspective comes more easily through interdisciplinary work, Perkins says, because the nature of each discipline is defined partly through its relation to the others; and the unique qualities of each come into sharper focus when the disciplines are compared and contrasted.

For example, many students have "a narrow, distorted view of the mathematical enterprise," Perkins charges. They see mathematics as a set of routines one can execute, with a limited range of applications: primarily, household budgeting and income tax returns.

Through interdisciplinary projects, however, students can see the discipline in a new light. In studying the Westward Expansion, for example, students could use mathematics to analyze the number of people involved, the miles they traveled, their food and water needs, and so on. By applying math in this context, students would learn the value of mathematical modeling, of using mathematics to characterize a situation—an application they don't typically experience in math class.

The project would also give students a new perspective on the Westward Expansion, he says, helping them conceive it as a mass movement, rather than seeing it solely through an individual participant's story, the way the topic is usually presented.

Sparking insights is the goal, says Wiggins. Good interdisciplinary instruction creates conditions for students to see connections spontaneously, "without having their noses rubbed in it," he says. Ideally, students will have "flashes of insight and meaning" when they "understand simultaneously something about each discipline and how each informs the other." For example, a student might get an insight into calculus from reading philosophy.

Suzanne Krogh of Western Washington University, who in 1987–88 taught 2nd graders at an international school in Barcelona, believes her students *did* learn better as a result of the thematic units she used—although that improved learning was not reflected on standardized tests. Her students learned more about the real world, did a better job of synthesizing learning into a meaningful whole, and became more reflective and motivated learners, she says.

How Much Is Enough?

While experts agree on the value of making connections across disciplines, opinions differ regarding how much of the curriculum should be devoted to interdisciplinary studies. Most experts recommend striking a balance between integrated units and discipline-based work, to capitalize on the strengths of both approaches. Some, however, take a more radical position in favor of a fully integrated curriculum in which discipline boundaries are completely dissolved.

Perkins poses the "how much" question this way: Should the basic organizing scheme of the school day be a set of disciplines with cross-pollination, or cross-disci-

the future."

"We're not just saying to kids, 'What do you want to do?'" Beane emphasizes. Instead, the approach is tightly structured. Whatever themes are chosen should have "major self and social significance," he says.

Instruction has more power if you build the curriculum around what students see as relevant right now, agrees Gordon Vars of Kent State University. Vars sees no reason to be concerned if students cite trivial interests. In the hands of a good teacher, he says, even something frivolous can lead to serious study. If the starting point is Nintendo, for example, students' explorations can encompass science, math, social studies, psychology, English, and technology.

Krogh confirms that students don't necessarily want to study pop-culture fluff. Intrigued by differences between languages, her class of 2nd graders at an international school in Spain asked to study language roots. The students created charts of languages that evolved from Latin, studied linguistics and geography, and traced the influence of the ancient Romans.

Such enthusiasm comes as no surprise to Wasley. When teachers honor students' natural investigative qualities, students produce sophisticated work, she says. "People like to create their own learning tasks." ■

plinary enterprises with frequent focused dips into the disciplines?

"It's a very tricky question," he says, "because it's a values question as well as a pedagogy question." To answer it, educators must first decide whether they value "disciplinary expertise or flexible eclecticism" more highly—an issue not easy to resolve.

Deciding the question on pedagogical grounds is no easier. "It's not clear which [approach] would serve the learner best in the long run," Perkins says. "We don't know enough about brain research and the nature of learning to say" which approach would yield the most learning. "I could trump up arguments on both sides."

Other experts are more definite in their advice. Kovalik believes the goal should be to provide students with a totally integrated day. She worries that efforts to pursue interdisciplinary units will not go far enough for teachers to realize the potential of thematic studies.

Wasley agrees that the payoffs of fully integrated instruction are "a lot bigger" than those of a more modest interdisciplinary approach. "I don't have much confidence in disciplines," she says, adding that she doesn't see enough advantages to the disciplines to justify sticking with them.

Like most experts on the topic, Jacobs advocates finding a balance between the two approaches. "Let's get away from the rigidity of the disciplines, but let's not backlash and go to the other extreme," she advises.

Although she believes educators "haven't done the disciplines well," Jacobs doesn't want to abandon them. "I don't think it's a good idea to drop the power of what each discipline can offer," she says. The disciplines are "straightforward and focused." At their best, each offers a problem-solving method—such as the empirical method in science—and a body of skills that can be "very enabling" to students. "Some skills and perspectives are taught well through periodical visiting through the disciplines," she says.

The most effective schools deliberately provide students with a variety of experiences, Jacobs says. She uses an analogy to make her point: Learning through an integrated approach based on broad themes is like looking through a wide-angle lens; learning through the disciplines is like looking through a zoom lens. "You want the wide-angle lens, and you want the focus of the zoom," she says. "You see different things when you zoom in."

Wiggins agrees that the disciplines should not be abolished. A totally integrated approach is dangerous, he believes, because, over the long term, it "equips the student for everything and hence for nothing"—as would learning "athletics" without training in any particular sport.

Another expert who sees value in the disciplines is David Ackerman, superintendent of the Catalina Foothills School District in Tucson, Ariz., who has written on curriculum integration. "It's a long way from being demonstrated that [a fully integrated approach] offers students more than subject-based instruction," he cautions. For example, "it's not *a priori* obvious" that a thematic course in which a student learns some chemistry will be as effective as a first-rate chemistry course. And, he points out, in the work world, people do tend to have subject-specific knowledge.

Educators need to consider carefully which approach will best serve students, he emphasizes. They should ask, "What do kids need to know?" and then consider what curricular structure will help students get that knowledge most effectively. To decide whether an interdisciplinary approach makes sense, teachers should consider these questions:

- If I use an interdisciplinary approach, is there a reasonable chance my students will understand more insightfully?
- Will knowledge from one subject strengthen students' understanding of concepts in another?
- Will this approach enhance the learning of discipline-based concepts?
- Is the content an important part of my subject? Is it something I would choose to teach anyway?

The teacher should look for "cross-cutting ideas with hybrid vigor," Ackerman says. Topics from different disciplines should be integrated when "to treat those ideas in isolation can be weaker than having several teachers come at it from different angles."

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>
> *—Heidi Hayes Jacobs*

Covering Objectives

Some skeptics warn that interdisciplinary instruction could make it more difficult for teachers to cover all of their curricular objectives—that important content will slip through the loosely woven net of thematic instruction.

"In the past, that's happened," concedes Jacobs. Some teachers have chosen a theme and then presented "a collage of randomly selected activities" instead of a coherent unit—a shortcoming Jacobs has termed the "potpourri problem." To avoid that mistake, teachers need to structure connections carefully. Units can't be created whimsically, she emphasizes.

It's "absolutely not" more difficult to cover objectives, Krogh says. Teachers should make a list of objectives and then "find ways to put them under the umbrella of a theme." The process is not difficult, but it does require more organization up front, she says.

"Sometimes there's learning the kids need that doesn't fit under an integrative umbrella," Krogh notes, adding that math skills sometimes fall into this category. When that happens, teachers should "just admit it" and teach the content in some other way. "There's no point in being contrived about it."

Integrated instruction is "not a matter of throwing everything up in the air," says Wasley. Teachers still have curricular objectives, such as having their students read the classics or understand how the government works; and they don't stop teaching discipline-based skills. "When you integrate, you don't abdicate responsibility" to monitor what students are learning, she says.

Far from missing objectives, teachers using integrated instruction can reinforce them many more times than in traditional instruction, says Kovalik. "Teach in context and that's key," she urges. If students don't know how to divide, for example, teachers should teach them in a brief "skill shop" and then quickly "allow them to continue the application."

While Ebersole is confident that interdisciplinary instruction can be used to deliver essential learnings, he concedes that proof is lacking. "We need research and evidence that interdisciplinary teaching does not neglect mastery of essential concepts of the disciplines," he says.

Obstacles Faced

Not surprisingly, interdisciplinary efforts—which swim against the tide of tradition—face a number of obstacles. One that observers often mention is the lack of time teachers have to plan interdisciplinary instruction.

"The heart of this is to empower the teacher as a designer and writer of curriculum," says Jacobs. Yet teachers may have very little time to devote to those pursuits. (One way to skirt this problem is to use "off-the-shelf" interdisciplinary programs, some of which are excellent, observers say. However, experts caution that "importing" a unit may not work, because teachers will have no investment in the curriculum decisions made for them by the unit's authors.)

Another commonly cited obstacle is the structure of the school day, which is parcelled into short blocks of time. Thematic instruction tends to flourish in longer time frames, which allow for in-depth investigations. Yet changes in school scheduling practices to allow more flexibility are coming at a slow rate. "We absolutely have to reconfigure the way we use our time," Jacobs insists.

Nor should it be assumed that teachers automatically know how to collaborate, experts say. Most teachers are accustomed to working solo, and they may find it difficult to give up autonomy to work with others, Wasley says. They can ease that transition through frank discussions and "contracts" that specify conditions such as "no talking behind a colleague's back," she suggests.

The territoriality of teachers can be another obstacle to change. Many teachers, particularly at the high school level, will fight to defend their subjects from what they see as encroachment. When teachers at Fryeburg Academy in Fryeburg, Maine, began to explore linking the disciplines, "the departments were very threatened," says Jan Hastings, a music teacher at the school. Major concerns included the need to stick to the prescribed curriculum and the obligation to prepare students for the next level of instruction.

Curriculum materials can also be part of the problem rather than the solution. In examining social studies curriculums, Jere Brophy of Michigan State University has seen many misguided attempts at integration. "People who put together these curriculum materials are systematically dreaming up ways to integrate across subjects," he says. Unfortunately, they often merely insert isolated language arts skills—such as alphabetizing state capitals—that have "no social studies value at all." Integration is a tool to larger ends, Brophy notes. Sometimes "the means become an end in themselves."

Students can also be obstacles. Some students, particularly older ones, "are highly resistant to seeing the art teacher in the same room with the science teacher," Jacobs reports. Once these students have had a satisfying experience with interdisciplinary instruction, however, they're typically delighted, she says.

Moving Forward

Despite the obstacles, many states and districts are moving forward with interdisciplinary instruction, experts say.

In Colorado, the state department of education has started an "Interdisciplinary Core Academy" to help middle school teachers learn about interdisciplinary instruction, says Judith Gilbert, a senior consultant to the Colorado Department of Education. Teams of teachers attend the

Support from the Subject Areas

It would be understandable if the subject area organizations opposed interdisciplinary instruction. That doesn't appear to be the case, however. The National Council of Teachers of English (NCTE), for example, is "very interested" in interdisciplinary instruction, says Charles Suhor, the group's deputy executive director. "We've had our foot in that door for quite a while." English teachers have always linked to other disciplines, such as history, in a "piecemeal" fashion, he says. And whole language is "inherently interdisciplinary" because it links with all subject areas, he notes.

NCTE enthusiastically endorses "further exploration of the idea," Suhor says. However, he conjectures that the NCTE leadership is probably ahead of its constituency, saying this is "not something that's top priority for teachers who don't have time and resources."

Suhor is not worried that interdisciplinary instruction might erode his discipline's turf. "If students are understanding physics better by articulating it in their own words, they're doing English," he says.

Jim Gates, executive director of the National Council of Teachers of Mathematics (NCTM), is more guarded in his support for interdisciplinary instruction. "This is a sensitive area for us," he says. Math teachers tend to think in terms of integrating topics *within* their own discipline, he notes. "'Integrated' to our people means not taking algebra in a box or geometry in a box." And math teachers do not want math to be looked on primarily as a tool of science. When that happens, "the mathematical development of youngsters suffers," Gates believes.

One sign that the major subject area organizations are open to the idea of linking the disciplines is a collaborative effort among the International Reading Association, National Science Teachers Association, National Council for the Social Studies, NCTM, and NCTE, to explore interdisciplinary instruction at the pre-K through 4th grade level. The groups have agreed to identify outstanding teachers doing interdisciplinary instruction and ask them what would be most helpful to other teachers, says Karen Smith, NCTE's associate executive director, who is spearheading the effort. Further work on the project depends on whether the organizations can get approval from their governing boards.

"The disciplines should not be treated as mutually exclusive," Smith says. While the subject area groups may have been territorial in the past, "we all want the best curriculum for kids." ■

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Academy and work to develop interdisciplinary units. Gilbert is impressed by the "tremendous amount of time" teachers will commit to this undertaking.

"Virginia is ready to move ahead with an interdisciplinary approach where people are ready for it," says Carol Rezba of the state's department of education. Rezba, who is helping develop a common core of learnings for the state, says the common core "promotes an interdisciplinary approach" because the outcomes are common to all disciplines. That common thread "gives the opportunity to make connections and blur the boundaries" between disciplines. "We've spent a lot of time in our schools teaching minutiae," she says. "We have to help [students] see connections."

In Texas, state testing "is becoming much more integrated," says Jan Moberley of the Region 10 Education Service Center, which serves 80 Texas school districts. For example, social studies and science tests now bring in elements of writing, reading, and math. In response to the changes in assessment, instruction will become more integrated, she predicts. (And Texas is not the only state where assessment is becoming more interdisciplinary. "Several state exams have already shifted," says Jacobs, including the New York Regents exam, which now has interdisciplinary questions.)

Individual districts around the nation are also moving forward. "We threw out the [disciplines] at the elementary level," says Betty Shoemaker, K–8 curriculum coordinator for the Eugene, Ore., public schools. Now, the district encourages teachers to organize the curriculum around "major conceptual themes and strategic processes," she says. The themes include *communities, change, systems, power, interactions,* and *forms*; the strategic processes include reading, writing, listening, speaking, and so on. Over two-thirds of the teachers are actively involved in the effort, she says, creating their own materials and moving away from textbook-driven instruction. And, "by and large, parents love it."

New York City has also joined the movement. "The New York City board of education is pushing the whole city to go interdisciplinary," says Jaimie Cloud of the American Forum for Global Education. As a symbol of that intent, the discipline offices at the central board have been integrated, she says.

Ready for Change?

"We've erred in staying strictly in the disciplines," Jacobs says. As more and more educators work to correct that imbalance, it remains to be seen whether parents, employers, and college admissions officials will accept the move away from the traditional disciplines-only approach.

Some experts are optimistic that they will. "Teachers and principals think parents are less ready for change" than they really are, says Wasley. "Parents just want their kids to come home and say, 'We learned something great today.'" If students spend at least part of the school day learning in an interdisciplinary mode, these experts believe, the odds of that happening will be much greater. ■

Resources

From ASCD:

- ASCD sponsors a network on the topic of "Interdisciplinary Curriculum." For information, contact Ben Ebersole, Dept. of Education, Univ. of Maryland–Baltimore Co., Wilkens Ave., Baltimore, MD 21228; (301) 455-2378.
- The October 1991 issue of ASCD's journal, *Educational Leadership*, is devoted to the topic of "Integrating the Curriculum." Includes articles by Heidi Hayes Jacobs, David Perkins, and James Beane, among others. To order, contact ASCD's Order Processing Department at (703) 549-9110.
- *Interdisciplinary Curriculum: Design and Implementation*, edited by Heidi Hayes Jacobs, was published by ASCD in 1989. Includes chapters by Jacobs, David Ackerman, David Perkins, and others. Available from ASCD's Order Processing Department for $13.95. Cite stock no. 611-89156.
- Subscribers to the *ASCD Curriculum Handbook* have received two case studies related to interdisciplinary instruction: "Integrating the Primary Grades" (M. Hughes, June 1992) and "Make It Happen!" (J. Zorfass, Sept. 1991). For information about the *Handbook*, contact Gena Randall, (703) 549-9110, ext. 225.

From elsewhere:

- *How to Integrate the Curricula*, by Robin Fogarty, was published by Skylight Publishing in 1991. For information, contact Skylight Publishing, Inc., 200 E. Wood St., Ste. 274, Palatine, IL 60067; (800) 348-4474.
- *Restructuring for an Interdisciplinary Curriculum*, edited by John M. Jenkins and Daniel Tanner, was published by the National Association of Secondary School Principals in 1992. For information, contact NASSP, 1904 Association Dr., Reston, VA 22091-1537; (703) 860-0200.
- *The Integrated Early Childhood Curriculum*, by Suzanne Krogh, was published by McGraw-Hill in 1990. For information, contact McGraw-Hill Book Co., 1221 Ave. of the Americas, New York, NY 10020; (609) 426-5612. ■

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ROBERT E. SLAVIN

Cooperative Learning and the Cooperative School

The availability of models that can be used in math, reading, and writing at every grade level has made it possible to plan an elementary school around the concept of everyone's working together to improve all aspects of the school.

Photograph by Barbara [illegible]

The Age of Cooperation is approaching. From Alaska to California to Florida to New York, from Australia to Britain to Norway to Israel, teachers and administrators are discovering an untapped resource for accelerating students' achievement: the students themselves. There is now substantial evidence that students working together in small cooperative groups can master material presented by the teacher better than can students working on their own.

The idea that people working together toward a common goal can accomplish more than people working by themselves is a well-established principle of social psychology. What is new is that practical cooperative learning strategies for classroom use have been developed, researched, and found to be instructionally effective in elementary and secondary schools. Once thought of primarily as social methods directed at social goals, certain forms of cooperative learning are considerably more effective than traditional methods in increasing basic achievement outcomes, including performance on standardized tests of mathematics, reading, and language (Slavin 1983a, b; Slavin in press a).

"There is now substantial evidence that students working together in small cooperative groups can master material . . . better than can students working on their own."

Recently, a small but growing number of elementary and secondary schools have begun to apply cooperative principles at the school as well as the classroom level, involving teachers in cooperative planning, peer coaching, and team teaching, with these activities directed toward effective implementation of cooperative learning in the classroom. Many of these schools are working toward institutionalization of cooperative principles as the focus of school renewal.

This article reviews the research on cooperative learning methods and presents a vision of the next step in the progression of cooperative learning: the cooperative school.

What Is Cooperative Learning and Why Does It Work?

Cooperative learning refers to a set of instructional methods in which students work in small, mixed-ability learning groups. (See p. 11 for a vignette about one day in the life of a hypothetical cooperative school.) The groups usually have four members—one high achiever, two average achievers, and one low achiever. The students in each group are responsible not only for learning the material being taught in class, but also for helping their groupmates learn. Often, there is some sort of group goal. For example, in the Student Team Learning methods developed at Johns Hopkins University (Slavin 1986), students can earn attractive certificates if group averages exceed a pre-established criterion of excellence.

For example, the simplest form of Student Team Learning, called Student Teams-Achievement Division (STAD), consists of a regular cycle of activities. First, the teacher presents a lesson to the class. Then students, in their four-member mixed-ability teams, work to master the material. Students usually have worksheets or other materials; study strategies within the teams depend on the subject matter. In math,

Students, like teachers, learn by explaining a lesson. When students have to organize their thoughts to communicate ideas to teammates, they engage in cognitive elaboration that enhances their own understanding.

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students might work problems and then compare answers, discussing and resolving any discrepancies. In spelling, students might drill one another on spelling lists. In social studies, students might work together to find information in the text relating to key concepts. Regardless of the subject matter, students are encouraged not just to give answers but to explain ideas or skills to one another.

At the end of the team study period, students take brief individual quizzes, on which they cannot help one another. Teachers sum the results of the quizzes to form team scores, using a system that assigns points based on how much individual students have improved over their own past records.

The changes in classroom organization required by STAD are not revolutionary. To review the process, the teacher presents the initial lesson as in traditional instruction. Students then work on worksheets or other practice activities; they happen to work in teams, but otherwise the idea of practice following instruction is hardly new. Finally, students take a brief, individual quiz.

Yet, even though changes in classroom organization are moderate, the effects of cooperative learning on students can be profound. Because one student's success in the traditional classroom makes it more difficult for others to succeed (by raising the curve or raising the teacher's expectations), working hard on academic tasks can cause a student to be labeled as a "nerd" or a "teacher's pet." For this reason, students often express norms to one another that discourage academic work. In contrast, when students are working together toward a common goal, academic work becomes an activity valued by peers. Just as hard work in sports is valued by peers because a team member's success brings credit to the team and the school, so academic work is valued by peers in cooperative learning classes because it helps the team to succeed.

In addition to motivating students to do their best, cooperative learning also motivates students to help one another learn. This is important for several reasons. First, students are often able to translate the teacher's language into "kid language" for one another. Students who fail to grasp fully a concept the teacher has presented can often profit from discussing the concept with peers who are wrestling with the same questions.

Second, students who explain to one another learn by doing so. Every teacher knows that we learn by teaching. When students have to organize their thoughts to explain ideas to teammates, they must engage in cognitive elaboration that greatly enhances their own understanding (see Dansereau 1985).

Third, students can provide individual attention and assistance to one another. Because they work one-on-one, students can do an excellent job of finding out whether their peers have the idea or need additional explanation. In a traditional classroom, students who don't understand what is going on can scrunch down in their seats and hope the teacher won't call on them. In a cooperative team, there is nowhere to hide; there *is* a helpful, nonthreatening environment in which to try out ideas and ask for assistance. A student who gives an answer in a whole-class lesson risks being laughed at if the answer is wrong; in a cooperative team, the fact that the team has a "we're all in this together" attitude means that, when they don't understand, students are likely to receive help rather than derision.

"Students are often able to translate the teacher's language into 'kid language' for one another."

Under What Conditions Is Cooperative Learning Effective?

Cooperative learning is always fun; it almost always produces gains in social outcomes such as race relations; and it has never been found to reduce student achievement in comparison to traditional methods. However, a substantial body of research has established that two conditions must be fulfilled if cooperative learning is to enhance student achievement substantially. First, students must be working toward a group goal, such as earning certificates or some other recognition. Second, success at achieving this goal must depend on the individual learning of all group members (see Slavin 1983a, b; in press a).

Simply putting students into mixed-ability groups and encouraging them to work together are not enough to produce learning gains: students must have a reason to take one another's achievement seriously, to provide one another with the elaborated explanations that are critical to the achievement effects of cooperative learning (see Webb 1985). If students care about the success of the team, it becomes legitimate for them to ask one another for help and to provide help to each other. Without this team goal, students may feel ashamed to ask peers for help.

Yet team goals are not enough in themselves to enhance student achievement. For example, classroom studies in which students complete a common worksheet or project have not found achievement benefits for such methods. When the group task is to complete a single product, it may be most efficient to let the smartest or highest achieving students do most of the work. Suggestions or questions from lower-achieving students may be ignored or pushed aside, as they may interfere with efficient completion of the group task. We can all recall being in lab groups in science class or in project groups in social studies in which one or two group members did all the work. To enhance the achievement of all students, then, group success must be based not on a single group product, but on the sum of individual learning performances of all group members.

The group's task in instructionally effective forms of cooperative learning is almost always to prepare group members to succeed on individual assessments. This focuses the group activity on explaining ideas, practicing skills, and assessing all group members to ensure that all will be successful on learning assessments.

When cooperative learning methods provide group goals based on the learning of all members, the effects on student achievement are remarkably consistent. Of 38 studies of at least four weeks' duration comparing cooperative methods of this type to traditional control methods, 33 found significantly greater achievement for the cooperatively taught classes, and 5 found no significant differences (Slavin in press a). In contrast, only 4 of 20 studies that evaluated forms of cooperative learning lacking group goals based on group members' learning found positive achievement effects, and 3 of these are studies by Shlomo Sharan and his colleagues in Israel that incorporated group goals and individual accountability in a different way (see Sharan et al. 1980, Sharan et al. 1984).

Successful studies of cooperative learning have taken place in urban, rural, and suburban schools in the U.S., Canada, Israel, West Germany, and Nigeria, at grade levels from 2 to 12, and in subjects as diverse as mathematics, language arts, writing, reading, social studies, and science. Positive effects have been found on such higher-order objectives as creative writing, reading comprehension, and math problem solving, as well as on such basic skills objectives as language mechanics, math computations, and spelling. In general, achievement effects have been equivalent for high, average, and low achievers, for boys and girls, and for students of various ethnic backgrounds. As noted earlier, positive effects of cooperative learning have also been found on such outcomes as race relations, acceptance of mainstreamed academically handicapped classmates, and student self-esteem and liking of class (see Slavin 1983a).

> **"In a cooperative team, there is nowhere to hide; there *is* a helpful, nonthreatening environment in which to try out ideas and ask for assistance."**

Comprehensive Cooperative Learning Methods

The cooperative learning methods developed in the 1970s—Student Teams-Achievement Divisions and Teams-Games-Tournaments (Slavin 1986); Jigsaw Teaching (Aronson et al. 1978); the Johnsons' methods (Johnson and Johnson 1986); and Group Investigation (Sharan et al., 1984)—all are generic forms of cooperative learning. They can be used at many grade levels and in many subjects. The broad applicability of these methods partly accounts for their popularity. A one- or two-day workshop given to a mixed group of elementary and secondary teachers of many subjects can get teachers off to a good start in most of the methods, which makes this an ideal focus of staff development.

However, because the early cooperative learning methods are generally applicable across grade levels and subjects, they tend not to be uniquely adapted to any particular subject or grade level. Also, the methods developed earlier are mostly curriculum-free; they rarely replace traditional texts or teaching approaches. As a result, these methods are most often applied as supplements to traditional instruction and rarely bring about fundamental change in classroom practice.

Since 1980, research and development on cooperative learning conducted at Johns Hopkins University has begun to focus on comprehensive cooperative learning methods designed to replace traditional instruction *entirely* in particular subjects and at particular grade levels. Two major programs of this type have been developed and successfully researched: Team Accelerated Instruction (TAI) in mathematics for grades 3–6, and Cooperative Integrated Reading and Composition (CIRC) in reading, writing, and language arts for grades 3–5. The main elements of these programs are described below.

Team Accelerated Instruction (TAI). Team Accelerated Instruction shares with STAD and the other Student Team Learning methods the use of four-member mixed-ability learning teams and certificates for high-performing teams. But where STAD uses a single pace of instruction for the class, TAI combines cooperative learning with individualized instruction. TAI is designed to teach mathematics to students in grades 3–6 (or older students not ready for a full algebra course).

In TAI, students enter an individualized sequence according to a placement test and then proceed at their own rates. In general, team members work on different units. Teammates check each other's work against answer sheets and help one another with any problems. Final unit tests are taken without teammate help and are scored by student monitors. Each week, teachers total the number of units completed by all team members and give certificates or other rewards to teams that exceed a criterion score based on the number of final tests passed, with extra points for perfect papers and completed homework.

Because students are responsible for checking each other's work and managing the flow of materials, the teacher can spend most class time presenting lessons to small groups of students drawn from the various teams who are working at the same point in the mathematics sequence. For example, the teacher might call up a decimals group, present a lesson, and then send the students back to their teams to work on decimal problems. Then the teacher might call the fractions group, and so on.

In TAI, students encourage and help one another to succeed because they want their teams to succeed. Individual accountability is assured because the only score that counts is the final test score, and students take final tests without teammate help. Students have equal opportunities for success because all have been placed according to their level of prior knowledge; it is as easy (or difficult) for a low achiever to complete three subtraction units in a week as it is for a higher-achieving classmate to complete three long division units.

However, the individualization that is part of TAI makes it quite different from STAD. In mathematics, most concepts build on earlier ones. If the earlier concepts were not mastered, the later ones will be difficult or impossible to learn—a student who cannot subtract or multiply will fail to master long division, a student who does not understand fractional concepts will fail to understand what a decimal is, and so on. In TAI, students work at their own levels, so if they lack prerequisite skills they can build a strong foundation before going on. Also, if students can learn more rapidly, they need not wait for the rest of the class.

Individualized mathematics instruction has generally failed to increase student mathematics achievement in the past (see Horak 1981), probably because the teacher's time in earlier models was entirely taken up with checking work and managing materials, leaving little time for actually teaching students. In TAI, students handle the routine checking and management, so the teacher can spend most class time teaching. This difference, plus the motivation and help provided by students within their cooperative teams, probably accounts for the strong positive effects of TAI on student achievement.

Five of six studies found substantially greater learning of mathematics computations in TAI than in control classes, while one study found no differences (Slavin, Leavey, and Madden

A Visit to a Cooperative School

It is Friday morning at "Cooper Elementary School." In Ms. Thompson's third-grade, the students are getting ready for reading. They are sitting in teams at small tables, four or five at each table. As the period begins, Ms. Thompson calls up the "Rockets". Pairs of students from several of the small groups move to a reading group area, while the remaining students continue working at their desks. In Ms. Thompson's class the students at their desks are working together on activities quite different from the usual workbooks. They are taking turns reading aloud to each other; working together to identify the characters, settings, problems, and problem solutions in stories; practicing vocabulary and spelling; and summarizing stories to one another. When Ms. Thompson finishes with the Rockets, they return to their groups and begin working together on the same types of activities. Ms. Thompson listens in on some of the students who are reading to each other and praises teams that are working well. Then she calls up the "Astros," who leave their teams to go to the reading group.

Meanwhile, in Mr. Fisher's fifth-grade, it is math period. Again, students are working in small teams, but in math, each team member is working on different materials depending on his or her performance level. In the teams students are checking one another's work against answer sheets, explaining problems to one another, and answering each other's questions. Mr. Fisher calls up the "Decimals" group for a lesson. Students working on decimals leave their teams and move to the group area for their lesson. When the lesson is over, the students return to their teams and continue working on decimals.

In Mr. Fisher's class there are five learning disabled students, who are distributed among the various teams. The special education resource teacher, Ms. Walters, is teaming with Mr. Fisher. While he is giving lessons, she is moving through the class helping students. At other times, Ms. Walters gives math lessons to groups of students who are having difficulties in math, including her five LD students, while Mr. Fisher works with students in their team areas.

In Mr. Green's fourth-grade class it is writing time. Mr. Green starts the period with a brief lesson on *"and disease,"* the tendency to write long sentences connected by too many *"ands."* Then the students work on compositions in teams. They cooperatively plan what they will write and then do a draft. The students read their drafts to their teammates and receive feedback on what their teammates heard, what they liked, and what they wanted to hear more about. After revising their drafts, students hold editing conferences with teammates focusing on the mechanics of the composition.

While the students are writing, Mr. Green is moving from team to team, listening in on what they are saying to each other and conferencing with individual students to help them. Also in the class is Ms. Hill, another fourth-grade teacher. She and Mr. Green began using writing process methods at the same time and are coaching each other as they use them in their classes. At the end of the day the two teachers will meet to discuss what happened, and to plan the next steps jointly. On other days, a substitute will cover Mr. Green's class while he visits Ms. Hill's writing class.

All over Cooper Elementary School, students are working in cooperative teams, and teachers are working together cooperatively to help students learn. In the first grades, students are working in pairs taking turns reading to each other. In the sixth grades students are doing team science projects in which each team member is responsible for a part of the team's task. Second-graders are working in teams to master capitalization and punctuation rules.

At the end of the day, teachers award certificates to teams that did outstanding work that week. Those teams that met the highest standards of excellence receive "Superteam" certificates. Throughout the school the sounds of applause can be heard.

After the students have gone home, the school steering committee meets. Chaired by the principal, the committee includes representatives of teachers at several grade levels, plus two parent representatives. The committee discusses the progress they are making toward their goal of becoming a cooperative school. Among other things, the committee decides to hold a school fair to show what the school is doing, to display the students' terrific cooperative work in writing, science, and math; and to encourage parents to volunteer at the school and to support their children's success at home.

—Robert E. Slavin

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1984; Slavin, Madden, and Leavey 1984; Slavin and Karweit 1985). Across all six studies, the TAI classes gained an average of twice as many grade equivalents on standardized measures of computation as traditionally taught control classes (Slavin in press b). For example, in one 18-week study in Wilmington, Delaware, the control group gained .6 grade equivalents in mathematics computations, while the TAI classes gained 1.7 grade equivalents (Slavin and Karweit 1985). These experimental-control differences were still substantial (though smaller) a year after the students were in TAI.

Cooperative Integrated Reading and Composition (CIRC). The newest of the Student Team Learning methods is a comprehensive program for teaching reading and writing in the upper elementary grades. In CIRC, teachers use basal readers and reading groups, much as in traditional reading programs. However, students are assigned to teams composed of pairs from two different reading groups. While the teacher is working with one reading group, students in the other groups are working in their pairs on a series of cognitively engaging activities, including reading to one another; making predictions about how narrative stories will come out; summarizing stories to one another; writing responses to stories; and practicing spelling, decoding, and vocabulary. Students also work in teams to master main idea and other comprehension skills. During language arts periods, a structured program based on a writing process model is used. Students plan and write drafts, revise and edit one another's work, and prepare for publication of team books. Lessons on writing skills such as description, organization, use of vivid modifiers, and on language mechanics skills are fully integrated into students' creative writing.

In most CIRC activities, students follow a sequence of teacher instruction, team practice, team pre-assessments, and a quiz. That is, students do not take the quiz until their teammates have determined they are ready. Certificates are given to teams based on the average performance of all team members on all reading and writing activities. Two studies of CIRC (Stevens et al. in press) found substantial positive effects from this method on standardized tests of reading comprehension, reading vocabulary, language expression, language mechanics, and spelling, in comparison to control groups. The CIRC classes gained 30 to 70 percent of a grade equivalent more than control classes on these measures in both studies. Significantly greater achievement on writing samples favoring the CIRC students was also found in both studies.

Cooperative learning takes place in reading groups when students practice vocabulary words or summarize stories to one another

A New Possibility

The development and successful evaluation of the comprehensive TAI and CIRC models has created an exciting new possibility. With cooperative learning programs capable of being used all year in the 3 Rs, it is now possible to design an elementary school program based upon a radical principle: students, teachers, and administrators can work *cooperatively* to make the school a better place for working and learning.

There are many visions of what a cooperative elementary school might look like, but there is one model that my colleagues and I have begun to work toward in partnership with some innovative practitioners. Its major components are as follows.

1. *Cooperative learning in the classroom.* Clearly, a cooperative elementary school would have cooperative learning methods in use in most classrooms and in more than one subject. Students and teachers should feel that the idea that students can help one another learn is not just applied on occasion, but is a fundamental principle of classroom organization. Students should see one another as resources for learning, and there should be a schoolwide norm that every student's learning is everyone's responsibility, that every student's success is everyone's success.

2. *Integration of special education and remedial services with the regular program.* In the cooperative elementary school, mainstreaming should be an essential element of school and classroom organization. Special education teachers may team-teach with regular teachers, integrating their students in teams with nonhandicapped students and contributing their expertise in adapting instruction to individual needs to the class as a whole. Similarly, Chapter I or other remedial services should be provided in the regular classroom. If we take seriously the idea that all students are responsible for one another, this goes as much for students with learning problems as for anyone else. Research on use of TAI and CIRC to facilitate mainstreaming and meet the needs of remedial readers has found positive effects on the achievement and social acceptance of these students (see Slavin 1984, Slavin et al. in press).

3. *Peer coaching.* In the cooperative elementary school, teachers should be responsible for helping one another to use cooperative learning methods successfully and to implement other improvements in instructional practice. Peer coaching (Joyce et al. 1983) is perfectly adapted to the philosophy of the cooperative school; teachers learn new methods together

and are given release time to visit one another's classes to give assistance and exchange ideas as they begin using the new programs.

4. *Cooperative planning.* Cooperative activities among teachers should not be restricted to peer coaching. In addition, teachers should be given time to plan goals and strategies together, to prepare common libraries of instructional materials, and to make decisions about cooperative activities involving more than one class.

5. *Building-level steering committee.* In the cooperative elementary school, teachers and administrators should work together to determine the direction the school takes. A steering committee composed of the principal, classroom teacher representatives, representatives of other staff (e.g., special education, Chapter 1, aides), and one or more parent representatives meets to discuss the progress the school is making toward its instructional goals and to recommend changes in school policies and practices to achieve these goals.

6. *Cooperation with parents and community members.* The cooperative school should invite the participation of parents and community members. Development of a community sense that children's success in school is everyone's responsibility is an important goal of the cooperative school.

The Cooperative School Today

To my knowledge, there is not yet a school that is implementing all of the program elements listed here, but a few enterprising and committed schools are moving in this direction. In Bay Shore (New York) School District, teachers in two intermediate schools are using CIRC in reading, writing, and language arts, and STAD in math. In Alexandria, Virginia, Mt. Vernon Community School is working with the National Education Association's Mastery in Learning project to build a cooperative school plan. At Mt. Vernon, a building steering committee is planning and helping to implement a gradual phasing in of the TAI math program and CIRC reading, writing, and language arts programs. Several schools throughout the U.S. that have successfully implemented TAI math are now planning to add CIRC for reading and writing instruction, and are looking toward full-scale implementation of a cooperative school plan. Most schools that have focused school renewal efforts on widespread use of cooperative learning are at the elementary level; but several middle, junior high, and high schools have begun to work in this direction as well.

In a time of limited resources for education, we must learn to make the best use of what we have. Cooperative learning and the cooperative school provide one means of helping students, teachers, and administrators work together to make meaningful improvements in the learning of all students. ☐

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Multiple Intelligences Go to School

Educational Implications of the Theory of Multiple Intelligences

HOWARD GARDNER THOMAS HATCH

A new approach to the conceptualization and assessment of human intelligences is described. According to Gardner's Theory of Multiple Intelligences, each human being is capable of seven relatively independent forms of information processing, with individuals differing from one another in the specific profile of intelligences that they exhibit. The range of human intelligences is best assessed through contextually based, "intelligence-fair" instruments. Three research projects growing out of the theory are described. Preliminary data secured from Project Spectrum, an application in early childhood, indicate that even 4- and 5-year-old children exhibit distinctive profiles of strength and weakness. Moreover, measures of the various intelligences are largely independent and tap abilities other than those measured by standard intelligence tests.

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Despite swings of the pendulum between theoretical and applied concerns, the concept of intelligence has remained central to the field of psychology. In the wake of the Darwinian revolution, when scientific psychology was just beginning, many scholars became interested in the development of intelligence across species. The late 19th and early 20th centuries were punctuated by volumes that delineated levels of intelligence across species and within the human species (Baldwin, 1895; Hobhouse, 1915; Romanes, 1892). Francis Galton (cousin of Charles Darwin) was perhaps the first psychologically oriented scientist to try to measure the intellect directly. Though Galton (1870) had a theoretical interest in the concept of intelligence, his work was by no means unrelated to practical issues. A committed eugenicist, he sought to measure intelligence and hoped, through proper "breeding," to increase the overall intelligence of the population.

During the following half century, many of the most gifted and influential psychologists concerned themselves with the nature of human intelligence. Although a few investigators were interested principally in theoretical issues, most seasoned their concerns with a practical orientation. Thus Binet (Binet & Simon, 1916) and Terman (1916) developed the first general-purpose intelligence tests in their respective countries; Yerkes (Yerkes, Bridges, & Hardwick, 1915) and Wechsler (1939) created their own influential instruments. Even scientists with a strong theoretical bent, like Spearman (1927) and Thurstone (1938), contributed either directly or indirectly to the devising of certain measurement techniques and the favoring of particular lines of interpretation.

By midcentury, theories of intelligence had become a staple of psychology textbooks, even as intelligence tests were taken for granted in many industrialized countries. Still, it is fair to say that, within scientific psychology, interest in issues of intelligence waned to some extent. Although psychometricians continued to perfect the instruments that purported to measure human intellect and some new tests were introduced (Guilford, 1967), for the most part, the burgeoning interest in cognitive matters bypassed the area of intelligence.

This divorce between mainstream research psychology and the "applied area" of intelligence might have continued indefinitely, but, in fact, by the late 70s, there were signs of a reawakening of interest in theoretical and research aspects of intelligence. With his focus on the information-processing aspects of items in psychological tests, Robert Sternberg (1977, 1982, 1985) was perhaps the most important catalyst for this shift, but researchers from a number of different areas of psychology have joined in this rediscovery of the centrality of intelligence (Baron, 1985; Brown & Campione, 1986; Dehn & Schank, 1982; Hunt, 1986; Jensen, 1986; Laboratory of Comparative Human Cognition, 1982; Scarr & Carter-Salzman, 1982; Snow, 1982).

The Theory of Multiple Intelligences

A decade ago Gardner found that his own research interests were leading him to a heightened concern with issues of human intelligence. This concern grew out of two disparate factors, one primarily theoretical, the other largely practical.

As a result of his own studies of the development and breakdown of cognitive and symbol-using capacities, Gardner (1975, 1979, 1982) became convinced that the Piagetian (Piaget, 1970) view of intellect was flawed. Whereas Piaget (1962) had conceptualized all

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aspects of symbol use as part of a single "semiotic function," empirical evidence was accruing that the human mind may be quite modular in design. That is, separate psychological processes appear to be involved in dealing with linguistic, numerical, pictorial, gestural, and other kinds of symbolic systems (Gardner, Howard, & Perkins, 1974; Gardner & Wolf, 1983). Individuals may be precocious with one form of symbol use, without any necessary carryover to other forms. By the same token, one form of symbol use may become seriously compromised under conditions of brain damage, without correlative depreciation of other symbolic capacities (Wapner & Gardner, 1979). Indeed, different forms of symbol use appear to be subserved by different portions of the cerebral cortex.

On a more practical level, Gardner was disturbed by the nearly exclusive stress in school on two forms of symbol use: linguistic symbolization and logical-mathematical symbolization. Although these two forms are obviously important in a scholastic setting, other varieties of symbol use also figure prominently in human cognitive activity within and especially outside of school. Moreover, the emphasis on linguistic and logical capacities was overwhelming in the construction of items on intelligence, aptitude, and achievement tests. If different kinds of items were used, or different kinds of assessment instruments devised, a quite different view of the human intellect might issue forth.

These and other factors led Gardner to a conceptualization of human intellect that was more capacious. This took into account a wide variety of human cognitive capacities, entailed many kinds of symbol systems, and incorporated as well the skills valued in a variety of cultural and historical settings. Realizing that he was stretching the word *intelligence* beyond its customary application in educational psychology, Gardner proposed the existence of a number of relatively autonomous *human intelligences*. He defined intelligence as the capacity to solve problems or to fashion products that are valued in one or more cultural settings and detailed a set of criteria for what counts as a human intelligence.

Gardner's definition and his criteria deviated significantly from established practices in the field of intelligence (however, see Guilford, 1967; Thurstone, 1938). Most definitions of intelligence focus on the capacities that are important for success in school. Problem solving is recognized as a crucial component, but the ability to fashion a product—to write a symphony, execute a painting, stage a play, build up and manage an organization, carry out an experiment—is not included, presumably because the aforementioned capacities cannot be probed adequately in short-answer tests. Moreover, on the canonical account, intelligence is presumed to be a universal, probably innate, capacity, and so the diverse kinds of roles valued in different cultures are not considered germane to a study of "raw intellect."

For the most part, definitions and tests of intelligence are empirically determined. Investigators search for items that predict who will succeed in school, even as they drop items that fail to predict scholastic success. New tests are determined in part by the degree of correlation with older, already accepted instruments. In sharp contrast, existing psychometric instruments play no role in Gardner's formulation. Rather, a candidate ability emerges as an intelligence to the extent that it has recurred as an identifiable entity in a number of different lines of study of human cognition.

To arrive at his list of intelligences, Gardner and his colleagues examined the literature in several areas: the development of cognitive capacities in normal individuals; the breakdown of cognitive capacities under various kinds of organic pathology; the existence of abilities in "special populations," such as prodigies, autistic individuals, idiots savants, and learning-disabled children; forms of intellect that exist in different species; forms of intellect valued in different cultures; the evolution of cognition across the millennia; and two forms of psychological evidence—the results of factor-analytic studies of human cognitive capacities and the outcome of studies of transfer and generalization. Candidate capacities that turned up repeatedly in these disparate literatures made up a provisional list of human intelligences, whereas abilities that appeared only once or twice or were reconfigured differently in diverse sources were abandoned from consideration.

The methods and the results of this massive survey are reported in detail in *Frames of Mind* (Gardner, 1983) and summarized in several other publications (Gardner, 1987a, 1987b; Walters & Gardner, 1985). Gardner's provisional list includes seven intelligences, each with its own component processes and subtypes (see Table 1). It is claimed that, as a species, human beings have evolved over the millennia to carry out at least these seven forms of thinking. In a biological metaphor, these may be thought of as different mental "organs" (Chomsky, 1980); in a computational metaphor, these may be construed as separate information-processing devices (Fodor, 1983). Although all humans exhibit the range of intelligences, individuals differ—presumably for both hereditary and environmental reasons—in their current profile of intelligences. Moreover, there is no necessary correlation between any two intelligences, and they may indeed entail quite distinct forms of perception, memory, and other psychological processes.

Although few occupations rely entirely on a single intelligence, different roles typify the "endstates" of each intelligence. For example, the "linguistic" sensitivity to the sounds and construction of language is exemplified by the poet, whereas the interpersonal ability to discern and respond to the moods and motivations of other people is represented in the therapist. Other occupations more clearly illustrate the need for a blend of intelligences. For instance, surgeons require both the acuity of spatial intelligence to guide the scalpel and the dexterity of the bodily-kinesthetic intelligence to handle it. Similarly, scientists often have to depend on their linguistic intelligence to describe and explain the discoveries made using their logical-mathematic intelligence, and they must employ interpersonal intelligence in interacting with colleagues and in maintaining a productive and smoothly functioning laboratory.

The Education and Assessment of Intelligences

Until this point, we have been reviewing the history of intelligence research, admittedly from the perspective of the Theory of Multiple Intelligences (hereafter MI Theory). Since the publication of *Frames of Mind* (Gardner, 1983), we and our colleagues have been involved in investigating its implications. On the one hand, we seek to determine the scientific adequacy of the theory (for a

TABLE 1

The Seven Intelligences

Intelligence	End-States	Core Components
Logical-mathematical	Scientist Mathematician	Sensitivity to, and capacity to discern, logical or numerical patterns; ability to handle long chains of reasoning.
Linguistic	Poet Journalist	Sensitivity to the sounds, rhythms, and meanings of words; sensitivity to the different functions of language.
Musical	Composer Violinist	Abilities to produce and appreciate rhythm, pitch, and timbre; appreciation of the forms of musical expressiveness.
Spatial	Navigator Sculptor	Capacities to perceive the visual-spatial world accurately and to perform transformations on one's initial perceptions.
Bodily-kinesthetic	Dancer Athlete	Abilities to control one's body movements and to handle objects skillfully.
Interpersonal	Therapist Salesman	Capacities to discern and respond appropriately to the moods, temperaments, motivations, and desires of other people.
Intrapersonal	Person with detailed, accurate self-knowledge	Access to one's own feelings and the ability to discriminate among them and draw upon them to guide behavior; knowledge of one's own strengths, weaknesses, desires, and intelligences.

discussion of some of the scientific questions raised by the theory, see Gardner, 1983, chapter 11, and Walters & Gardner, 1986). On the other hand, in our view, a principal value of the multiple intelligence perspective—be it a theory or a "mere" framework—lies in its potential contributions to educational reform. In both cases, progress seems to revolve around assessment. To demonstrate that the intelligences are relatively independent of one another and that individuals have distinct profiles of intelligences, assessments of each intelligence have to be developed. To take advantage of students' multiple intelligences, there must be some way to identify their strengths and weaknesses reliably.

Yet MI Theory grows out of a conviction that standardized tests, with their almost exclusive stress on linguistic and logical skills, are limited. As a result, the further development of MI Theory requires a fresh approach to assessment, an approach consistent with the view that there are a number of intelligences that are developed—and can best be detected—in culturally meaningful activities (Gardner, in press-a). In the remainder of the paper, we describe our approach to assessment and broadly survey our efforts to assess individual intelligences at different age levels. In addition, we report some preliminary findings from one of our projects and their implications for the confirmation (or disconfirmation) of MI Theory.

If, as argued, each intelligence displays a characteristic set of psychological processes, it is important that these processes be assessed in an "intelligence-fair" manner. In contrast to traditional paper-and-pencil tests, with their inherent bias toward linguistic and logical skills, intelligence-fair measures seek to respect the different modes of thinking and performance that distinguish each intelligence. Although spatial problems can be approached to some degree through linguistic media (like verbal directions or word problems), intelligence-fair methods place a premium on the abilities to perceive and manipulate visual-spatial information in a direct manner. For example, the spatial intelligence of children can be assessed through a mechanical activity in which they are asked to take apart and reassemble a meat grinder. The activity requires them to "puzzle out" the structure of the object and then to discern or remember the spatial information that will allow reassembly of the pieces. Although linguistically inclined children may produce a running report about the actions they are taking, little verbal skill is necessary (or helpful) for successful performance on such a task.

Whereas most standard approaches treat intelligence in isolation from the activities of a particular culture, MI theory takes a sharply contrasting tack. Intelligences are always conceptualized and assessed in terms of their cultural manifestation in specific domains of endeavor and with reference to particular adult "end states." Thus, even at the preschool level, language capacity is not assessed in terms of vocabulary, definitions, or similarities, but rather as manifest in story telling (the novelist) and reporting (the journalist). Instead of attempting to assess spatial skills in isolation, we observe children as they are drawing (the artist) or taking apart and putting together objects (the mechanic).

Ideally, one might wish to assess an intelligence in a culture-independent way, but this goal has proved to be elusive and perhaps impossible to achieve. Cross-cultural research and studies of cognition in the course of ordinary activities (Brown, Collins, & Duguid, 1989; Laboratory of Comparative Human Cognition, 1982; Lave, 1988; Rogoff, 1982; Scribner, 1986) have demonstrated that performances are inevitably dependent on a person's familiarity and experience with the materials and demands of the assessments. In our own work, it rapidly became clear that meaningful assessment of an intelligence was not possible if students had little or no experience with a particular subject matter or type of material. For example, our examination of bodily-kinesthetic abilities in a movement assessment for preschoolers was confounded by the fact that some 4-year-olds had already been to ballet classes, whereas others had never been asked to move their bodies expressively or in rhythm. This recognition reinforced the notion that bodily-kinesthetic intelligence cannot be assessed outside of a specific medium or without reference to a history of prior experiences.

Together, these demands for assessments that are intelligence fair, are based on culturally valued activities, and take place within a familiar context naturally lead to an approach that blurs the distinctions between curriculum and assessment. Drawing information from the regular curriculum ensures that the activities are familiar; introducing activities in a wide range of areas makes it possible to challenge and examine each intelligence in an appropriate manner. Tying the activities to inviting pursuits enables students to discover and develop abilities that in turn increase their chances of experiencing a sense of engagement and of achieving some success in their society.

Putting Theory Into Practice

In the past 5 years, this approach to assessment has been explored in projects at several different levels of schooling. At the junior and senior high school level, Arts PROPEL, a collaborative project with the Educational Testing Service and the Pittsburgh Public School System, seeks to assess growth and learning in areas like music, imaginative writing, and visual arts, which are neglected by most standard measures (for further details, see Gardner, in press-b; Wolf, 1989; Zessoules, Wolf, & Gardner, 1988). Arts PROPEL has developed a series of modules, or "domain projects," that serve the goals of both curriculum and assessment. These projects feature sets of exercises and curriculum activities organized around a concept central to a specific artistic domain—such as notation in music, character and dialogue in play writing, and graphic composition in the visual arts. The drafts, sketches, and final products generated by these and other curriculum activities are collected in portfolios (sometimes termed "process-folios"), which serve as a basis for assessment of growth by both the teacher and the student. Although the emphasis thus far has fallen on local classroom assessments, efforts are also under way to develop criteria whereby student accomplishment can be evaluated by external examiners.

At the elementary level, Patricia Bolaños and her colleagues have used MI theory to design an entire public school in downtown Indianapolis (Olson, 1988). Through a variety of special classes (e.g., computing, bodily-kinesthetic activities) and enrichment activities (a "flow" center and apprentice-like "pods"), all children in the Key School are given the opportunity to discover their areas of strength and to develop the full range of intelligences. In addition, over the course of a year, each child executes a number of projects based on schoolwide themes such as "Man and His Environment" or "Changes in Time and Space." These projects are presented and videotaped for subsequent study and analysis. A team of researchers from Harvard Project Zero is now engaged in developing a set of criteria whereby these videotaped projects can be assessed. Among the dimensions under consideration are project conceptualization, effectiveness of presentation, technical quality of project, and originality, as well as evidence for cooperative efforts and distinctive individual features.

A third effort, Project Spectrum, codirected by David Feldman of Tufts University, has developed a number of curriculum activities and assessment options suited to the "child-centered" structure of many preschools and kindergartens (for details, see Hatch & Gardner, 1986; Krechevsky & Gardner, in press; Malkus, Feldman, & Gardner, 1988; Ramos-Ford & Gardner, in press; Wexler-Sherman, Feldman, & Gardner, 1988). At present, there are 15 different activities, each of which taps a particular intelligence or set of intelligences. Throughout the year, a Spectrum classroom is equipped with "intelligence-fair" materials. Miniature replicas and props invite children to deploy linguistic intelligence within the context of story telling; household objects that children can take apart and reassemble challenge children's spatial intelligence in a mechanical task; a "discovery" area including natural objects like rocks, bones, and shells enables children to use their logical abilities to conduct small "experiments," comparisons, and classifications; and group activities such as a biweekly creative movement session can be employed to give children the opportunity to exercise their bodily-kinesthetic intelligence on a regular basis.

Provision of this variety of "high-affordance" materials allows children to gain experiences that engage their several intelligences, even as teachers have the chance unobtrusively to observe and assess children's strengths, interests, and proclivities. More formal assessment of intelligences is also possible. Researchers can administer specific games to children and apply detailed scoring systems that have been developed for research purposes. For instance, in the bus game, children's ability to organize numerical information is scored by noting the extent to which they can keep track of the number of adults and children getting on and off a bus. Adults and children and on and off constitute two different dimensions. Thus, a child can receive one of the following scores: 0—no dimensions recorded; 1—disorganized recording of one dimension (either adults and children or on and off); 2—labeled, accurate recording of one dimension; 3—disorganized recording of two dimensions; 4—disorganized recording of one dimension and labeled, accurate recording of one dimension; or 5—labeled, accurate recording of two dimensions (for further information, see Krechevsky, Feldman, & Gardner, in press).

We have also created a related instrument, the Modified Spectrum Field Inventory, that samples several intelligences in the course of two 1-hour sessions. Although this inventory does not draw directly from the curriculum, it is based on the kinds of materials and activities that are common in many preschools. In addition, related materials from the Spectrum curriculum can be implemented in the classroom to ensure that the children will be familiar with the kinds of tasks and materials used in the inventory.

Preliminary Results From Project Spectrum

Although none of these programs is in final form, and thus any evaluation must be considered preliminary and tentative, the results so far at the pilot sites seem promising. The value of rich and evocative materials has been amply documented. In the classrooms in Pittsburgh, Indianapolis, and Boston, teachers report heightened motivation on the part of the students, even as students themselves appreciate the opportunity to reflect on their own growth and development. Moreover, our programs with both older and younger children confirm that a consideration of a broader range of talents brings to the fore individuals who previously had been considered unexceptional or even at risk for school failure.

As for the assessment instruments under development, only those of Project Spectrum have been field tested in classrooms. In 1987-1989, we used these instruments in two different settings to investigate the hypothesis that the intelligences are largely independent of one another. To examine this hypothesis, we sought to determine (a) whether young children exhibit distinct profiles of intellectual strengths and weaknesses and (b) whether or not performances on activities designed to tap different intelligences are significantly correlated. In the 1987–1988 academic year, 20 children from a primarily White upper middle-income population took part in a yearlong Spectrum program. In the 1988–1989 academic year, the Modified Spectrum Field Inventory was piloted with 15 children in a combined kindergarten and first-grade classroom. This classroom was in a public school in a low-to-middle-income school district.

In the preschool study, children were assessed on 10 different activities (story telling, drawing, singing, music perception, creative movement, social analysis, hypothesis testing, assembly, calculation and counting, and number and notational logic) as well as the Stanford-Binet Intelligence Scale, Fourth Edition. To compare children's performances across each of the activities, standard deviations were calculated for each activity. Children who scored one or more standard deviations above the mean were judged to have a strength on that activity; those who scored one or more standard deviations below the mean were considered to have a weakness on that activity. This analysis revealed that these children did not perform at the same level across activities and suggested that they do have distinct intellectual profiles. Of the 20 children, 15 demonstrated a strength on at least one activity, and 12 children showed a weakness on one or more activities. In contrast, only one child was identified as having no strengths or weaknesses, and her scores ranged from $-.98$ to $+.87$ standard deviations from the mean.

These results were reinforced by the fact that, for the most part, children's performances on the activities were independent. Using Spearman rank-order correlations, only the number activities, both requiring logical-mathematical intelligence, proved significantly correlated with one another ($r = .78$, $p < .01$). In the other areas, music and science, where there were two assessments, there were no significant correlations. Conceivably, this result can be attributed to the fact that the number activities, both of which involved calculation, shared more features than the music activities (singing and music perception) or the science activities (hypothesis-testing and mechanical skill). Of course, the small sample size also may have contributed to the absence of powerful correlations among measures.

A comparison of the Spectrum and Stanford-Binet assessments revealed a limited relationship between children's performances on these different instruments. Spearman rank-order correlations showed that only performances on the number activities were significantly correlated with IQ (dinosaur game, $r = .69$, $p < .003$; bus game, $r = .51$, $p < .04$). With its concentration on logical-mathematic and linguistic skills, one might have expected a significant correlation with the Spectrum language activity as well. Conceivably, there was no significant correlation because the Stanford-Binet measures children's vocabulary and comprehension, whereas Spectrum measures how children *use* language within a story-telling task.

In the second study, eight kindergartners (four boys and four girls) and seven first graders (five girls and two boys) were assessed on the seven activities of the Modified Spectrum Field Inventory (MSPFI). This inventory, based on the activities developed for the yearlong Spectrum assessments of preschoolers, consists of activities in the areas of language (storyboard), numbers and logic (bus game), mechanics (assembly), art (drawing), music (xylophone games), social analysis (classroom model), and movement (creative movement). These assessments were administered in two 1-hour sessions. Each activity was videotaped, and children were scored by two independent observers. Spearman rank-order correlations between the scores of the two observers ranged from .88 (language) to .97 (art) and demonstrated the interrater reliability of these scores.

As in the first study, strengths and weaknesses were estimated using standard deviations. Unlike the findings from the earlier study, however, these results revealed that some children performed quite well and others performed quite poorly across many of the activities. It appears that the small sample size and wide age ranges may have contributed to this result. Of the five first-grade girls, none demonstrated a weakness in any area; all showed at least one strength, with one girl having strengths in six of the seven areas. The two first-grade boys showed no strengths, and both demonstrated weaknesses in three areas. Of the kindergartners, only two showed any strengths, with all but one of the other children showing at least one weakness. Quite possibly, these results reflect differences in developmental level, and perhaps gender differences as well, that did not obtain in the preschool sample and that may have overpowered certain individual differences. It is also conceivable that a more extended exposure to, and greater familiarity with, the Spectrum materials and activities, as in the yearlong Spectrum program, may have made the individual differences among younger children more visible.

Nonetheless, an examination of children's ranks on each of the activities revealed a more complex picture. Although the first-grade girls dominated the rankings, all but two children in the sample were ranked among the top five on at least one occasion. All but one child also scored in the bottom five on at least one activity. Considered in this way, children did exhibit relative strengths and weaknesses across the seven activities.

To determine whether or not performance on one activity was independent of performance on the other activities, we standardized each of the scores with a mean = 0 and standard deviation = 1 (Sattler, 1988) and performed Spearman rank-order correlations. Because of the superior performance of the first-grade girls, the performances of kindergartners and first graders were computed separately. Consideration of the kindergartners alone revealed only one correlation, between art and social analysis, that approached significance ($r = .66$, $p < .071$). For the sample of first graders, including the "high"-scoring girls, there were a number of significant correlations: language and assembly ($r = .77$, $p < .04$), language and numbers ($r = .81$, $p < .027$), movement and social analysis ($r = .77$, $p < .04$), and assembly and numbers ($r = .79$, $p < .034$).

With the exception of the performance of the first graders in the second study, these results are reasonably consistent with the claims of MI Theory. For younger children, performances on the Spectrum activities were largely independent, relative strengths and weaknesses were uncovered, and there was a significant correlation between preschoolers' performances on the

Spectrum activities and the Stanford-Binet in one of the two areas where it would be expected. Further investigations need to be conducted to establish norms, to identify strengths and weaknesses consistently, and to examine fully the effects of age and gender on the Spectrum activities.

Conclusion

In this essay, we have sketched the background and the major claims of a new approach to the conceptualization and assessment of human intelligence. Put forth in 1983, the theory of multiple intelligences has inspired a number of research-and-development projects that are taking place in schools ranging from preschool through high school. Until now, our focus has fallen largely on the development of instruments that can assess strengths and weaknesses in an "intelligence-fair" way. This research-and-development process has proved time consuming and costly. The measures must involve materials that are appealing and familiar to children; there is little precedent for developing scoring systems that go beyond linguistic and logical criteria; and materials appropriate for one age group, gender, or social class may not be appropriate for others. Of course, it should be recalled that huge amounts of time and money have already been invested in standard psychometric instruments, whose limitations have become increasingly evident in recent years.

Once adequate materials have been developed, it becomes possible to begin to address some of the theoretical claims that grow out of MI Theory. We have presented here some preliminary findings from one of our current projects. These results give some support to the major claims of the theory, inasmuch as children ranging in age from 3 to 7 do exhibit profiles of relative strength and weakness. At the same time, even these preliminary data indicate that the final story on Multiple Intelligences may turn out to be more complex than we envisioned. Thus, the rather different profile of results obtained with our two young populations indicates that, in future research, we must pay closer attention to three factors: (a) the developmental appropriateness of the materials; (b) the social class background, which may well exert an influence on a child's ability and willingness to engage with diverse materials; and (c) the exact deployment of the Spectrum materials and assessment instruments in the classroom.

Some critics have suggested that MI Theory cannot be disconfirmed. The preliminary results presented here indicate some of the ways in which its central claims can indeed be challenged. If future assessments do not reveal strengths and weaknesses within a population, if performances on different activities prove to be systematically correlated, and if constructs (and instruments) like the IQ explain the preponderance of the variance on activities configured to tap specific intelligences, then MI Theory will have to be revamped. Even so, the goal of detecting distinctive human strengths, and using them as a basis for engagement and learning, may prove to be worthwhile, irrespective of the scientific fate of the theory.

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SCIENCE EDUCATION: IT'S NOT ENOUGH TO 'DO' OR 'RELATE'

BY KATHLEEN J. ROTH

ELEMENTARY SCIENCE teaching has not changed much in the last forty years; it was, and is, basically fact oriented and didactic. Textbooks present science as a large body of knowledge, and science learning involves memorizing facts about dinosaurs, planets, weather, etc. A crowded elementary curriculum and elementary teachers' lack of expertise in science pose an additional, enduring problem: Very little instructional time is allotted to science teaching. Reformers have not been satisfied with a science curriculum that emphasizes recall of facts, and this dissatisfaction has led to a series of attempts to change the nature of elementary science teaching. Each of these efforts has attempted to help students develop higher-order thinking skills—to think scientifically.

By far the most serious and best supported of these reform attempts was the inquiry movement in the 1960s and 1970s, which gave rise to extensive National Science Foundation programs in curriculum development and teacher education. By the 1980s, however, it was apparent that the inquiry movement had failed to achieve its goals. Teaching practice and commercial materials had adopted some of the rhetoric of inquiry teaching but had not changed their basic character and had not had a significant impact on student learning outcomes.

Thus in the 1980s the reform movement split into three groups: a) a still-powerful group that continues to advocate inquiry teaching, (b) a Science-Technology-Society (STS) group that focuses on changing the goals and content of science teaching, and (c) a conceptual change group that focuses on changing the methods of instruction so that they are more responsive to students' thinking and development. All of these groups agree on the need for reform and on goals that emphasize the development of conceptual understanding and higher-level thinking skills. Advocates of the three perspectives, however, differ in their definition of the relationships among content, process, and attitude goals; in their analyses of the nature of scientific thinking; and in their recommendations about what elementary children can and should be taught about science and the nature of scientific thinking.

Each of the three perspectives contrasts with traditional elementary science teaching in that they each select particular goals for focus and suggest a framework to help teachers focus on meaningful outcomes, instead of trying to "cover it all." While it is tempting to think about ways to blend the three perspectives, in this analysis I will stress the *distinctions* among them. I argue that elementary teachers need a framework or instructional model that helps them limit and focus their teaching on meaningful, achievable learner outcomes; telling teachers to "do it all" is counterproductive. An eclectic approach to science instruction (throw

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in a little bit of everything) is all too evident, I fear, in most elementary science textbooks in use today.

A brief description of typical textbook-based instruction will be used as a point of contrast with the three alternative perspectives. To provide additional points of contrast, examples of how each perspective might organize instruction to teach fifth graders about plants and photosynthesis will be described.

TRADITIONAL TEXTBOOK-BASED SCIENCE TEACHING

The traditional method of teaching science is focused on textbook instruction and didactic teaching. This content-mastery approach to science is organized around discrete topics—planets, electricity, magnetism, dinosaurs—with little attempt to make connections across topics. The instructional pattern typically consists of reading the text followed by answering factual questions posed by either the teacher or the text. Hands-on activities and teacher demonstrations are added to foster motivation but are often selected because they are easy to do or fun rather than for their usefulness in developing conceptual understanding or higher-level thinking. Thus, science teaching (and scientific thinking) is viewed as student acquisition of facts.

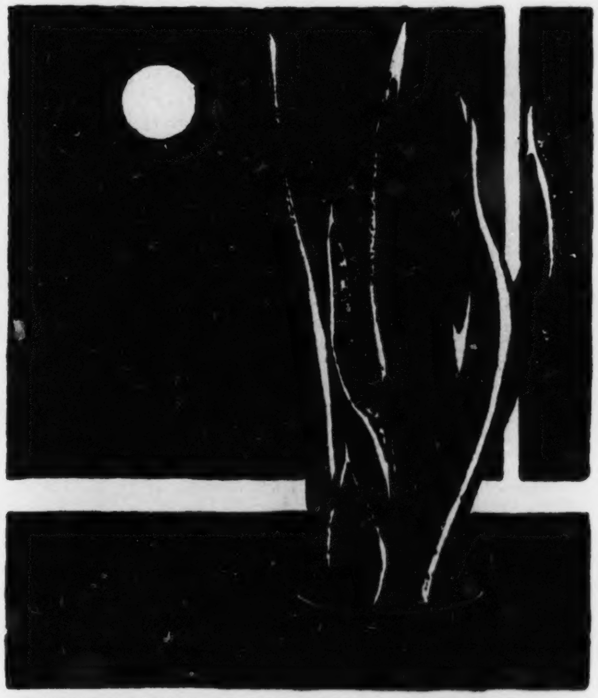
In the Silver Burdett & Ginn *Science* series (Mallinson, Mallinson, Valentino, & Smallwood, 1989), for example, fifth graders learn about photosynthesis in a chapter that presents a smorgasbord of information about activities of green plants. In five lessons, students learn about life processes; transportation of materials in plants; functions of roots, stems, and leaves; structure of leaf and stem cells (veins, stomata, chloroplasts, chlorophyll); the process of photosynthesis (role of energy, water, carbon dioxide; products); storage of manufactured food in fruits and vegetables; use of food energy in respiration; comparison of respiration and photosynthesis; and the use of energy for reproduction (parts of the flower, pollination, fertilization, germination). Thus, a wide spectrum of content is covered at a rapid pace.

In the lesson about photosynthesis, students read detailed information about the cell structure of leaves. The five steps in the photosynthetic process are listed and summarized in a word equation (water + carbon dioxide + energy → sugar + oxygen). To "evaluate student understanding," teachers are directed to ask factual questions that can be answered in short phrases taken directly from the text: What does a plant need to make food? (water, carbon dioxide, light energy) (Mallinson et al., 1989, p.12).

In a suggested enrichment activity, students look at leaf cells under a microscope. They draw cells and label the chloroplasts. In this lesson on photosynthesis, students read a lot of information and reproduce it in small bits when prompted by teacher questions. Only in a review question at the end are students required to explain anything (How do green plants make food?). The lesson does not ask students to use photosynthesis to explain everyday observations of plants or even to explain their observations in the enrichment activities.

The lesson on photosynthesis is followed by a lesson on plant respiration and a lesson on plant reproduction. This sequence of lessons does not seem likely to foster conceptual understanding and higher-level thinking. Instead, instruction is a parade of lessons marching along at a brisk pace, inundating observers (students) with a panoply of facts and concepts to be absorbed.

Eighty-nine percent of the students in our study [of the inquiry method] failed to grasp the central concept of the unit.



INQUIRY PERSPECTIVE

The inquiry perspective contends that students will develop better understandings of the nature of science and will be more interested in science if they are engaged in "doing" science. Student investigations of phenomena (not textbooks) are the backbone of the curriculum, and the focus of these investigations is on the use and development of science inquiry or process skills—predicting, hypothesizing, observing, recording data, making inferences and generalizations, etc. Students are viewed as little scientists who explore phenomena through hands-on activities and who use and develop scientific thinking skills to build up knowledge and conceptual understandings in the same ways that scientists use experimental work to construct new knowledge, concepts, and theories.

The proponents of an inquiry orientation acknowledge that science content and science thinking processes are both important, interrelated parts of science. They place a clear emphasis on the science thinking skills, however, allowing science content to play a secondary role. In the Elementary Science Study (ESS) materials (Educational Development Center, 1971), content is seen as almost irrelevant. The important thing is that children are engaged in scientific thinking and actions: asking questions, manipulating materials, observing phenomena, and making up explanations to answer their questions. Students "mess about" with mealworms or batteries or mystery powders, and the particular facts or concepts that they learn from these activities are not nearly as important as the lessons they learn about the nature of scientific inquiry.

In an inquiry perspective, the science process skills are generally regarded as the heart of scientific thinking, and these skills are typically organized in a hierarchical fashion. For example, the developers of *Science—A Process Approach* (SAPA) identified thirteen science processes and organized them in a hierarchy according to students' cognitive development (Commission on Science Education of the AAAS, 1968). Processes such as observing and classifying were seen as appropriate to teach at the early elementary level. Integrated process skills (hypothesizing, controlling variables, interpreting data, etc.) were deemed more complex and appropriate for the intermediate grades. Others organize these skills in a hierarchy that matches inductive models of a scientific method.

What is striking in the inquiry-oriented literature on higher-level thinking skills in science is the careful attention paid to describing and sequencing the science thinking process skills and the relative isolation of these thinking skills from a conceptual context. Little attention is given to the nature and development of scientific conceptual understanding. There is an underlying assumption that scientists' development of conceptual knowledge is a straightforward process: that conceptual knowledge is simply the "product" of the scientific thinking processes.

In an inquiry-oriented curriculum, science process skills are the main goal of elementary science teaching. Higher-level thinking is promoted by engaging students in using science processes in hands-on investigations. Content knowledge, conceptual understanding, and positive attitudes toward science are viewed as outgrowths of the inquiry investigations. The focus of instruction is on the development of process skills. If students can understand and use these general thinking process skills, they will be able to develop meaningful conceptual understanding in any area of study.

PHOTOSYNTHESIS IS the focus of the fifth-grade "Producers" unit in the SCIIS *Communities* Teacher's Guide (Knott, Lawson, Karplus, Thier, & Montgomery, 1978). In this unit, three major activities serve as the focus of classroom lessons, and no textbook is used. First, students germinate and measure the growth of various seed parts. This activity is designed to illustrate that germinating seed embryos get food from the seed.

In a second activity, students plant grass seeds and keep some in the light and some in the dark to demonstrate that plants need light to grow and to suggest that plants do not get food from the soil. Toward the end of this activity, the teacher explains photosynthesis to the students and the experiment is interpreted in light of this explanation. Finally, students germinate and measure the growth of bean plants under various conditions: with and without cotyledons (the developing embryo's food supply in the seed) and with and without light. Students are expected to use the idea of photosynthesis to explain their results.

Ms. Kain (pseudonym) and three other teachers whom we observed in our study (Roth, 1984; Smith & Anderson, 1984) spent six to eight weeks teaching this unit. In each of these classrooms, the bulk of instructional time was spent on setting up the experiments, measuring plants, recording results on a class scatter plot, and using the scatter plots to average data and draw line graphs to show patterns of growth. Discussions were also important aspects of lessons. Ms. Kain's questions focused on eliciting students' predictions, observations, and explanations of the experiments. She rarely gave out information, explaining photosynthesis only once during the unit and once in a unit review. Thus, Ms. Kain created many opportunities and a safe environment for students to construct their own explanations of observed phenomena; she never drilled students about definitions or details of the photosynthetic process. She spent eight weeks exploring photosynthesis with her students (approximately twenty-four lessons), quite a contrast with the one-lesson coverage of the Silver Burdett textbook.

And what did the students learn? Our post-tests (Roth, Smith & Anderson, 1983) assessed students' conceptual understanding by asking a variety of questions about how plants get their food. Eighty-nine percent of the students in the study failed to grasp the central concept of the unit: that plants get their energy-containing food only by making it internally out of carbon dioxide and water. Instead, most students began and ended the unit believing that plants take in food from the outside environment and that plants, like people, have many different kinds of food (air, water, fertilizer, minerals, soil, sun, etc.). Students watched and measured plants growing in the light and the dark, they conducted the experiments with germinating seedlings, but they interpreted these observations in terms of their preconceived ideas and failed to integrate the teacher's presentations of photosynthesis into their interpretations of the experiments. At best, students added plants' making of food as one of *many* sources of food for plants, failing to understand the *unique* ability of green plants to use light energy to convert non-energy-containing raw materials into energy-containing food that is necessary to support growth and life functions. A similar pattern was seen in textbook-focused classrooms. Thus, an inquiry approach did not provide any advantage in promoting conceptual understanding.

AND WHAT did students learn about the nature of scientific inquiry, scientific processes, and scientific attitudes? Many of them found "doing" science (the science processes) "fun" but ended up frustrated by the focus on processes and by all the measuring and recording of data. As Rachel explained,

> I don't know *why* we kept measuring those plants. I mean it was fun for awhile, but I already know that plants need light, and now I know it again.

What did Rachel learn about science processes and scientific thinking? She learned that it involves a lot of activity that does not help you make any better sense of things. She learned that science activities and processes are ends in themselves. It is important, for example, to make careful observations and to record them accurately not because such care helps you develop better understanding but because "that's what you do in science." Because Rachel did not develop better conceptual understanding, the processes of science seemed meaningless and not worth the effort. Driver (1983) critiques this doing of science in the absence of meaningful conceptual development, suggesting that the "I do and I understand" slogan might more appropriately be "I do and I am even more confused."

The results of this study also suggest that involvement in hands-on activities did not produce the desired student *attitudes* toward science. Although the activities made science seem fun, they did not necessarily help students value and feel comfortable with science. As a learner, Rachel was clearly frustrated that the doing of science did not lead her to any better personal understandings about plants' need for light. Although she was in a classroom environment where her ideas were valued and where she felt comfortable sharing her ideas, Rachel did not leave the unit feeling good about herself as a learner of science or comfortable in the neighborhood of science. She wondered why she held the same understandings at the end of the unit that she had held at the beginning. She had spent eight weeks measuring, observing, and talking about plants, and no change in her understanding had occurred! This was not a satisfying learning experience for her nor was it an experience that will make her enthusiastic about studying more science. These findings suggest that assessments of student attitudes toward science must dig beneath the surface; it is not enough to know that students have positive attitudes toward hands-on activities. What are they learning about science and scientific thinking?

SCIENCE-TECHNOLOGY-SOCIETY PERSPECTIVE

Many science educators advocate a dramatic change in the goals of K-12 science education. They argue that the overarching purpose of school science is not to create future scientists but to create citizens who understand science in multidimensional, multidisciplinary ways that will enable them to participate intelligently i critical thinking, problem solving, and decision making about how science and technology are used to change society (environmental issues, nuclear power, persona health, energy resources, etc.). Yager and Hofstei (1986) describe this perspective in sharp contrast t both the traditional, disciplinary-based focus of science teaching and to the inquiry approach:

> In some respects the traditional content and process dimensions of science may be the dimensions least important and appropriate to us in planning for the year 2000. They may be least important for helping us attain a scientifically and technologically literate citizenry for which so many yearn. If so, they may be the dimensions of science that deserve little or no emphasis as a science curriculum is planned and newly conceived for all K-12 students.

Yager and Hofstein suggest six essential goals of a quality K-12 science curriculum. These goals stand in clear contrast with those espoused by the inquiry perspective:

> 1. The human being, human potential, human advances, and human adaptations will serve as the organizer of the curriculum (instead of the structure of the disciplines or the scientific processes).
> 2. Current problems and societal issues will serve as the backbone of the curriculum.
> 3. Science and technological processes that students can use in everyday life will be emphasized over processes that scientists use.
> 4. Practice with decision-making skills using science and technology knowledge in a relevant, social context will be emphasized over skills needed to "uncover correct answers to discipline-bound problems."
> 5. Awareness should be an integral part of science learning.
> 6. In dealing with problems and issues, ethical, moral, and value dimensions will be considered (in contrast with traditional science instruction, which is taught as value free and discipline bound).

Thus, an STS curriculum is human and society focused, problem centered, and responsive to local issues. Problems to be investigated are selected for their relevance to students' lives and their multidisciplinary nature. As in the inquiry perspective, students are seen as active learners, but the activities they engage in are focused on *using* scientific and technological knowledge to solve problems and make decisions rather than on *creating* scientific knowledge. Thus, in the STS perspective, students act as young science citizens rather than young research scientists.

THE STS PERSPECTIVE shares with many of the inquiry programs a tendency to separate process goals from content goals and to emphasize process goals over content goals. Content is to be selected based on its interest and relevance for students and on the richness of the societal problem it provides. Thus, content is selected for its potential to serve the primary goals of developing students' decision-making and problem-solving process skills and of helping students learn to integrate values and moral thinking in this decision-making process.

Thus, process or thinking skills are of primary importance in the STS perspective, but the process skills are

As in the inquiry perspective, there is a striking lack of analysis in the STS literature about the particular content or concepts needed to make good decisions or to solve problems.

defined quite differently from those in inquiry programs. The processes emphasized in the STS perspective focus on wise *use* of scientific knowledge in decision making and problem solving about societal problems rather than on the construction of scientific knowledge through careful observation, inferencing, experimentation, etc.

In the STS perspective, decision making and problem solving are viewed as the higher-level thinking skills that students should develop. These skills are seen as needed by all students, not just those bound for science careers. To "think scientifically," then, one does not need to be able to create or discover scientific ideas the way a research scientist does. Rather, one needs to be a good consumer of scientific knowledge—finding and using scientific ideas as needed to solve particular problems.

As in the inquiry perspective, there is a striking lack of analysis in the STS literature about the particular content or concepts needed to make good decisions or to solve problems. The kinds of conceptual knowledge needed to do effective decision making and problem solving have not been carefully analyzed or defined. This lack of attention to the nature of conceptual understanding suggests an assumption that the conceptual knowledge needed to think scientifically (to make decisions and to solve problems) is straightforward information that students will rather easily incorporate into their own thinking. Thus, the challenge (or higher-level aspects) of scientific thinking is not in understanding concepts but in using concepts to make decisions and solve problems.

SINCE MATERIALS from an STS perspective are only now in the development phase, I will speculate about a possible STS unit on photosynthesis. A science-technology-society unit would probably not teach about photosynthesis as the focus of a unit. Instead, photosynthesis would be addressed in the context of exploring a technological or scientific problem facing society. For example, a unit might be structured around the problem of the effects of deforestation and industrialization on the warming of the Earth's atmosphere due to the greenhouse effect. Science concepts relevant to this problem include absorption of solar energy by the Earth's atmosphere and the changing balance of O_2-CO_2 in the Earth's atmosphere due to fossil fuel use and widespread cutting of rain forests (plants use carbon dioxide in the photosynthetic process and release oxygen). The teacher would help students use these concepts to assess the severity of the problem and to think about possible solutions to the growing danger of the greenhouse effect: Should the chopping down of rain forests be slowed down? How? Why would developing nations resist pressures to slow deforestation? What are other ways of slowing the greenhouse effect? How can local citizens influence decisions about slowing fossil fuel usage?

Unit activities might focus on role playing and assessment of the problems from different points of view. Scientific processes could be investigated in the context of studying the evidence that the greenhouse effect is actually a danger. Students might read arguments from scientists holding different opinions about the severity of the threat. The unit-culminating activity would be a student-generated activity designed to take action on these issues, such as writing and circulating a pamphlet about ways to reduce energy consumption in the home, studying home gas and electric bills and trying to decrease consumption for a month, writing to state representatives or members of Congress in support of particular bills related to energy issues, and planting trees on school grounds and encouraging others to plant trees.

In this approach, students would be engaged in complex thinking that requires them first to understand and evaluate the soundness of the evidence offered by expert scientists and then to integrate those understandings with understandings of social and political processes. For the unit to be meaningful and to result in student generation of a worthwhile project, the role of the teacher would be a very complex one. Teachers would have to understand underlying scientific principles, the evidence supporting scientists' predictions of the greenhouse effect, and the relationships between political and scientific issues.

The knowledge that students are likely to learn about photosynthesis in such a unit would be limited in the traditional disciplinary sense. For example, discussions of photosynthesis are likely to focus on CO_2-O_2 balance rather than on the food-making function. Because the unit activities focus on problem solving and citizenship action, students are more likely to end the unit understanding that extensive cutting of forests and burning of fossil fuels may result in warming climates worldwide rather than remembering much about photosynthesis. Helping students see how science and technology can both cause problems and help solve problems would be another challenge in teaching this unit. Without such an appreciation, students might come to view science and technology as evil and threatening. Thus, they would not value scientific inquiry and knowledge generated by science.

CONCEPTUAL CHANGE PERSPECTIVE

Of the three perspectives, the conceptual change perspective is the only one that did not originate in response to a social/political climate that demanded reform in science education. In contrast, it is a research-based perspective that grew out of cognitive science studies of learning and knowing in knowledge-rich domains. Research on teaching and learning in science, in particular, provided critical insights about why it is so difficult for students to develop useful, conceptual understandings of many of the subjects they are taught in school (Anderson and Roth, in press; West and Pines, 1985).

In a conceptual change perspective, the primary goal of science education is to help students develop meaningful, conceptual understandings of science and its ways of describing, predicting, explaining, and controlling natural phenomena (Anderson and Roth, in press; Driver, 1987). In this view, scientific knowledge is meaningful to learners only when it is *useful* in making sense of the world they encounter.

Scientific knowledge that can be used by learners is characterized by rich connections between concepts and facts and is organized around key ideas in ways that make the knowledge accessible and able to provide broad explanatory power. This stands in contrast to knowledge that exists as isolated fragments that students can parrot back for recall-focused tests but cannot apply in explaining real-world phenomena. Such connected knowledge is not locked into one tightly organized structure that simply gets larger as a learner adds new knowledge into it (a passive, additive view of learning and a static view of knowledge). Rather, this set of connected knowledge is flexible and constantly changing as the learner revises, reorganizes, and deepens understandings over time (an active, conceptual change view of learning and knowledge growth).

This web of knowledge, or the individual's conceptual ecology (Posner et al., 1982), only becomes useful and meaningful to students when it is integrated with the learners' own personal knowledge and experiences with natural phenomena. Students come to science classes with many ideas and explanations about natural phenomena. Their ideas are experience based and often stand in stark contrast to the scientific explanations studied in school. A central goal of science teaching is to help students *change* their intuitive, everyday ways of explaining the world around them—to incorporate scientific concepts and ways of thinking into their personal frameworks.

Like the STS advocates, advocates of a conceptual change perspective argue that a central goal of science education is to develop scientific literacy for *all* students. The two perspectives, however, define the nature of a scientifically literate society in different ways and they suggest different instructional approaches. The conceptual change perspective focuses on the power of conceptual understanding, arguing that the way to develop scientifically literate citizens is to change instruction so that it helps learners develop rich and meaningful understandings of whatever science they study. Such understanding will help students value science as a sense-making endeavor. The STS perspective, in contrast, approaches the need for a scientific citizenry from a curricular perspective, arguing that it is changes in the *content* of the curriculum that are critically needed. To capture the interests of all students, traditional disciplinary-bound curricula need to be abandoned in favor of current science and society issues.

Unlike the inquiry and STS perspectives, the conceptual change perspective views conceptual knowledge as central in science and in science learning. Where do the scientific processes fit in this scheme? Scientists' work, this position argues, is conceptually driven, and the so-called scientific processes cannot be separated from scientific conceptualizations. Science teaching, therefore, should integrate science processes and conceptual knowledge in ways that better reflect the richness and complexity of science itself.

WHAT DOES it mean to say that scientists' work is "conceptually driven"? Expert scientists do not hypothesize, make inferences, or design experiments in the absence of conceptual frameworks. Their conceptual frameworks are not only influenced by their observations and inferences; their frameworks also *drive* and shape the hypotheses they make, the questions they raise, the things they pay attention to in their observations. What distinguishes their work as science is not these processes, which are processes that are equally applicable in history, economics, mathematics, or the arts, but the particular knowledge that organizes how these processes are used. A scientist who observes well, for example, is not one who spends endless hours documenting and describing every possible detail that can be observed about a particular phenomenon. Instead, a good scientific observation focuses on key features in ways that will contribute new knowledge, that increases the explanatory power of a particular

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conceptual framework, that generates new understandings about relationships among concepts, or that raises significant questions about accepted conceptual frameworks. The scientist who makes such critical observations does not just happen to see what others have not seen because of expert "observation skills." To set up the conditions in which important observations are made, the scientist draws from existing conceptual knowledge, asks questions about important pieces of the framework, develops hypotheses, and designs experiments that will permit the critical and relevant observations to be made. Thus, skillful observation is intimately linked with both conceptual knowledge and with all the other "processes" of science. As Millar and Driver (1987) argue, each of the scientific "processes" can be submitted to a similar critique. These processes are not meaningful in isolation, and they are not science in the absence of a scientific conceptual framework.

Thus, the integration of science processes and conceptual knowledge is characteristic of expert scientists' thinking. In addition, this approach maps more effectively onto students' ways of learning science. When science processes are taught in relative isolation from conceptual knowledge, students often develop a misleading picture of science as "doing" for doing's sake. In my own studies of process-focused teaching, I identified students whose naive theories went unchallenged and unchanged despite weeks of process-focused instruction. These students did not view the processes of science as helping them better understand their world. Scientific processes, and science itself, were viewed as mysterious things that only certain smart people do and understand.

Practicing process skills in isolation of conceptual development does not help students understand how science processes are useful in understanding the world. Instruction that involves students in using these scientific processes to change their own theories in ways that are personally meaningful and consistent with scientific explanations provides a powerful alternative to process-focused instruction. To make such changes, students need to do difficult cognitive work that includes the use of science processes (predicting, hypothesizing, observing, inferring). Students do not, however, practice these processes in isolation and the goal is not for them to be better observers or predictors. Instead, these processes are used in the service of developing better explanations of natural phenomena.

THE CONCEPTUAL change perspective challenges two traditional ways of characterizing "higher-level thinking" in science. First, as discussed above, the usual representation of conceptual knowledge and science processes as separate kinds of scientific thinking does not accurately reflect what we have learned about the nature of science learning. Conceptual knowledge and the scientific processes must be intimately interwoven to be meaningful. Second, views of scientific thinking processes as a hierarchy of levels suggest that conceptual understanding is a relatively straightforward, lower-level process that students need as a basis for doing higher-level thinking. This view does not capture the ways in which the processes typically labelled as "higher order" (application, synthesis) are used in the development of meaningful, conceptual understandings.

In my own studies of middle school learners who successfully integrated ideas about photosynthesis into their personal conceptions about how plants get their food (Roth, 1986), I gained a new appreciation of the challenges students face in changing their personal theories and misconceptions and coming to understand scientific concepts. The successful conceptual change learners used a variety of "higher-level" thinking skills in the process of developing the conceptual understanding that plants make (rather than take in) their own food. These students continually tried to use new information to explain and make predictions about plants and their needs. Often this was a difficult and confusing process, as students encountered areas where their knowledge was incomplete or in conflict with ideas presented ("I thought *water* was the plants' food"). Such conflicts led to analyses of the differences between them and to restructuring of students' personal conceptual frameworks. Students used experimental observations as well as teacher explanations to help them rethink their ideas. These students were metacognitively active, monitoring their developing understandings and resolving areas of confusion ("If water isn't their food, then why does my Mom water her plants?"). In the end, they developed conceptual understandings of photosynthesis that they could use to explain why plants in a cave will die or why we need to water plants and give them sunlight. Their ability to apply these concepts to a variety of real-world phenomena, however, was a *reflection* of their conceptual understanding rather than a higher-level thinking skill that was developed after their conceptual understanding was in place (as suggested by taxonomies like Bloom's that place "application" at a higher level than "knowledge"). These students' conceptual learning was not straightforward, bounded, lower-level thinking. Their conceptual change learning required the integration of a variety of sophisticated, higher-level cognitive and metacognitive thinking skills. Thus, the development of meaningful conceptual knowledge is a complex process, involving a great deal of higher-order thinking. In a conceptual change perspective, conceptual understanding *is* higher-level thinking.

RECENTLY, I taught a group of fifth-grade students about photosynthesis using a modified version of conceptual change curriculum material I had written and evaluated in two earlier research studies (Roth, 1985; Roth & Anderson, 1987). The materials began by presenting a problem to be solved: What is food for plants? Only after students' entering answers to this question had been elicited and challenged was the idea of photosynthesis explained. Students were then given numerous opportunities to make sense—to reconcile the idea of photosynthesis with their entering conceptions. Photosynthesis was taught as a first step in helping students learn in a year-long program about ecological interactions and about changes in energy and matter.

The unit began by eliciting students' definitions of "food." The text explained the difference between everyday definitions of food (anything we eat or drink) and a definition of food as energy-containing matter. After agreeing that water is not food by this definition, the students became involved in a lively debate about how plants get their food. Most students asserted that water is one important food for plants, while others pointed out that water does not have energy in it. Students had interesting experience-based arguments to support their belief that water did provide energy for *plants* ("rain water has energy in it but drinking water doesn't"). The class made a chart listing their ideas about how plants get their food, and this chart was revisited several times throughout the month-long unit.

Two hands-on experiments (adapted from the SCIIS "Producer's" unit, Knott et al., 1978) and one discussion of a historical experiment provided initial information to help students puzzle through the problem of how plants get their food. An experiment with germinating seed parts suggested that young plant embryos get food that is stored in the seed's cotyledon. In discussing the results of this experiment, the idea that water did not contain energy for plants was again discussed. But many students still made predictions in the next experiment that grass seeds would grow in both light and dark conditions if they were watered because water is their food. Water was still a confusing issue.

While the grass seeds were given time to grow, von Helmont's famous experiment of 1642 was read and discussed. Students' predictions agreed with von Helmont's: As the tree in the tub of soil grows, the weight of the soil will decrease as the tree "eats" materials from the soil. When the students found out that the soil in von Helmont's experiment did not lose any significant weight, they accepted this as evidence that the plant was not "eating" soil. But they remained puzzled about why plants need soil and what fertilizers and minerals do for plants. I encouraged these questions while trying to keep the students focused on the problem of how plants get energy-containing food. As the grass plant experiment proceeded, and plants in the dark began to yellow and die, students became increasingly convinced that sunlight was somehow important and unsure about the role of water. Clearly, soil and water *alone* could not keep a plant alive. The sun seemed to be very important. But is the sun itself the food for plants, as many students believed?

Only when most of the students' entering ideas about food for plants had been either ruled out or brought into question was an explanation of photosynthesis given: that cells in plants' leaves use light energy from the sun to change water and air into energy-containing food. After this idea was explained in contrast with students' entering ideas, students were given many opportunities to use photosynthesis to explain everyday phenomena. In addition, their own application questions were rewarded and encouraged. One student, for example, wondered about the fact that *only* plants could make food. Did that mean that without plants, there would be no food? Another countered that we could live on candy bars if we didn't have plants. I encouraged this debate and later brought in Snickers bars. We analyzed the list of ingredients, talking about how each ingredient (corn syrup, sugar, peanuts, chocolate) had been made by a particular kind of plant.

I encouraged this debate and later brought in Snickers bars.

Application opportunities included problems posed in overhead transparencies (How did this plant produce a potato?), questions posed for students to write and/or talk about (What if only one leaf of a plant could get sunlight? Could it live? Why or why not?), and further experimentation. Students also wrote in science log books about their evolving ideas, receiving feedback questions and comments from the teacher. Application activities included analysis of controlled experiments as well as other, seemingly nonscientific activities, such as role playing the life of a bean seed embryo. Card-sorting activities where students constructed (in pairs and individually) different concept maps showing the relationships among ideas were also used.

At the end of the unit, students revisited their initial explanations of how plants got their food and wrote and talked about how their ideas had changed. The post-test asked a series of application questions for which students had to write out predictions and explanations. There was also a mini-interview question in which students were asked to arrange words related to photosynthesis (air, water, sun, fertilizers, soil, cotyledon, leaf, stem, etc.) in a conceptual map and then explain their arrangement. Most students demonstrated a coherent understanding of the key concepts; the interviewer questions permitted individual coaching to clarify remaining confusions. Students' comments and questions revealed ways in which their conceptual understanding had generated a new sense of wonder and sense making:

> John: Ms. Roth, I used to think that plants were just kind of *there*, ya' know? They just sat there. But now I know that they're really very busy little things, aren't they? There's lots going on inside them.
>
> Ted: I know plants can use water, air, and sun to make food . . . . but, I mean, *how* do they do that?

This unit involved much more time than the one lesson on photosynthesis outlined in the Silver Burdett & Ginn text (Mallinson et al., 1989). And yet the unit did not present many of the technical terms covered in the Silver Burdett & Ginn lesson—chloroplasts, stomata, carbon dioxide, hydrogen. But students were able to make predictions and observations, to change and develop explanations, and to apply ideas in a meaningful time frame; that is, they were provided time to change their understandings. The instructional model proved both workable for me and productive of meaningful

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conceptual understanding for my students. Although it did not call for explicit teaching of science processes, students regularly used these processes in constructing their developing understandings. Although it did not focus on exploration of societal issues, the unit provided a base for later study of the cutting down of rain forests explored during a unit on ecosystems. And students came to appreciate an issue important in their own society—that we need plants to produce *all* of our food (including Snickers!).

CONCLUSIONS

Each of the perspectives reviewed in this paper uses analyses of the nature of scientific thinking to define the goals of elementary science instruction and to advocate particular approaches to science teaching. The three perspectives share a concern that science teaching practice needs to change: It needs to become more focused on helping students think scientifically rather than on memorizing facts. To accomplish this goal, difficult curricular and instructional decisions have to be made. Given elementary teachers' limited time for planning and teaching of science, it is critical that the scope of the elementary science curriculum be limited and that teachers be supported in developing a coherent and manageable model or framework to guide their science planning and teaching. I find the conceptual change perspective to provide the most promise in terms of impact on students' understanding of science and scientific thinking. This framework also provides a useful tool for guiding daily teaching and planning because it frees teachers from long lists and hierarchies of skills and facts to be learned and helps them focus instead on important aspects of scientific understanding. ☐

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PETER J. FENSHAM

Science for All

To create a scientifically literate populace, curriculum developers must downplay the conceptual structures understood by the scientific elite and instead emphasize exciting examples and everyday applications.

Although science curriculums introduced during the 1960s and '70s have solved the problem of an inadequate supply of scientific personnel, the price of this achievement in science education has been that the great majority of students have learned that they are unable to do science, that

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After a decade of stagnation, science education in many countries is seeing renewed interest and nationally supported curriculum efforts.

In 1983 new funds in the U.S. initiated a number of projects. In Britain, the first major project since the '60s, the Secondary Science Curriculum Review, was established in 1982. Even earlier, New Zealand set up a Learning in Science Project in 1979 and, in 1982, a corresponding elementary school project. This new activity extends beyond developed or industrialized countries. In 1984 the Asia region of UNESCO, which ranges from Iran to Japan, endorsed a science education program as one its few priorities for the rest of the '80s.

In both rhetoric and rationale, these programs share in common a strong emphasis on Science for All. This slogan is a compelling and attractive one in societies where applied science and technology are evident in new products and new forms of communications. New jobs emerge and old, familiar ones disappear. There is a cry for new skills and expertise and a chronic toll of unemployed persons who lack technical skills.

The Science for All slogan has a democratic ring about it that implies there's something in it for everyone. It also acknowledges that science education in the past has *not* been science for all, that large numbers of persons have indeed been failed or passed over by the science curriculum. However, it should not be interpreted as a new educational intention or goal. The early 1960s are too recent and too well documented to be forgotten so easily. There was much in the writing and hopes of that massive wave of science curriculum endeavor around the world that spoke, in the language of those years, of science education that was to enrich the minds of all students. Although the activity of that decade initially focused on education in the more specialized disciplinary sciences of chemistry, physics, and biology, many projects then and in the early '70s aimed at mass education in elementary and junior high schools.

Simultaneously, this wave of curriculum development had affected countries all over the world, and the activity and exchange of ideas and materials for science education was quite unprecedented in any other field of the curriculum.

Historians of curriculum can take us further back to the 1860s in Great Britain and to the 1880s in the U.S. when a very promising approach to a science education for all was quite deliberately and ruthlessly obliterated because of the threat it held for a number of sectors of society. If we are to achieve anything in the present move for Science for All, we must see what we can learn from these earlier failures and from the ways in which they, in fact, succeeded in providing an education in science, not for all, but for a few.

Society's Demands on Functions of the Curriculum

Schools are established by society to fulfill a number of educational functions. The curriculum, in its parts and in its totality, is the instrument to serve these functions as well as the field where competing societal demands are resolved (see fig. 1).

The sciences, particularly the physical sciences in many societies, are gateway subjects that filter through the relatively few students who are allowed to move into professions of status, social experience, and economic security. Because of the social power associated with these positions, we can call this function a *political* function of schooling.

Again, a limited but definite number of persons with scientific skills and expertise are needed in any society to maintain and expand a variety of aspects of its economy. This limited population performs an *economic* function.

Scientists, particularly in research institutions and universities, are now a powerful faction with a major interest in maintaining their subject as an elite and important field. They are keenly interested in having the schools begin the process of reproduction of the sciences as those in higher education define them. This is the function of *subject maintenance*.

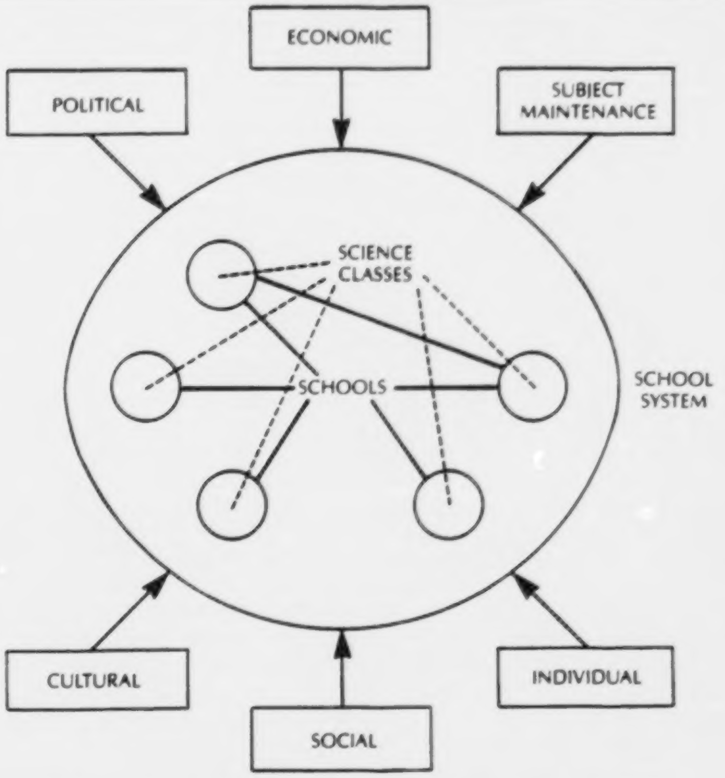

Fig. 1. Competing societal demands on schooling and science education

In addition, there are clearly a number of ways in which all *cultures* and *social* life are now influenced by knowledge from the sciences and its application. Human inventions in the sciences offer much potential for fulfilling the function of *individual* growth and satisfaction.

The first three of these social demands will be met, provided that only a relatively small number of students are successful in learning the sciences at school. Indeed, if a large number were successful, these social needs would be threatened by oversupply. Oversupply is an undesirable situation that has existed in many countries since the 1970s, when high school graduates' demand for places in higher education succeeded their availability and when persons with specialized training in science were unable to find appropriate employment.

The other three functions, on the other hand, are ones that relate to the whole population and will be met only if the majority of students successfully master the science curriculum.

Hence, these two demands are not simply competing but, in fact, are conflicting. Unless this is recognized and allowed for in the curriculum design for science education and in its implementation, there is no doubt one demand will win at the expense of the other. Indeed, there seems little doubt which will win since one has the backing of national imperatives like the economy and spheres of political influence, and the other, in comparison, may be seen as an essentially indulgent desire of the masses to improve their quality of life rather than fulfill specific, urgent needs.

Science Education for the Elite Few

Let me now turn to an analysis of the science curriculum movement of the 1960s-70s, and hence of much of our present science curriculums, to identify some elements that were quite contrary to our Science for All slogan and in the interests of educating an elite few in science.

1. The first curriculums to be redesigned in the U.S., Great Britain, Australia, Thailand, and Canada were those for the upper levels of secondary school where disciplinary sciences were taught, where only some of the school cohort studied them, and where they clearly existed as a prelude to further possible study in science.

2. This curriculum reform was very much in the hands or patronage of well-meaning academic and research-oriented disciplinary scientists, such as Pimentel at Berkeley for CHEM study and Nyholm at University College for Nuffield Chemistry, and similarly distinguished figures in physics and biology. To consider the nature of the reform these project teams brought about, it is important to have a measure of what actually resulted in classrooms, rather than what the rhetoric said was *supposed* to happen.

Descriptions of these courses and their guiding papers emphasize the structure of the knowledge of these sciences and the role of laboratory or empirical studies in its development. The courses were also designed with the very clear intention that both these features of natural science should be very explicit in the teaching and learning of science.

As a result, the direct uptake of these new courses and materials in Great Britain and the U.S. was not nearly as widespread among local school systems as was hoped. Furthermore, in practice in these countries and in many others where evaluative reports are available, there has been a selective emphasis on parts of these courses to the detriment of the new curriculum's intentions as a whole. The role of the laboratory, as part of the nature of science or as means of learning factual and conceptual knowledge, has been a major area of neglect. Most teachers and most examination systems seem also to have been unable to adopt the grand structural views of these science curriculums. Instead, they have turned them into conceptual statements, rules, and formulas to be learned without an adequate balance of the facts or realities of the natural phenomena to which they relate.

3. The teaching approach to this now heavily conceptual knowledge has too often followed a logical sequence determined by the significance of the knowledge in the discipline, and not by considerations of how it could be best learned. A concept is introduced, defined, quantified, refined, and then applied to more differentiated examples of the original concepts, and so on. This sequence of teaching is shown in Figure 2, in which each step is essential for the next but makes no sense of itself without a grasp of the steps that come earlier.

Such a teaching sequence turns out to be well suited to the tasks of sieving and sorting science students into an

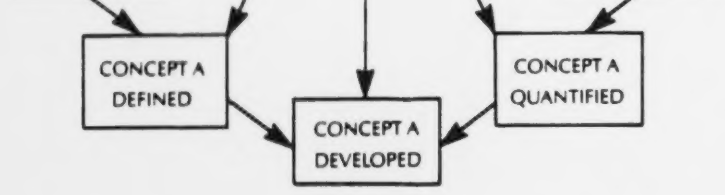

Fig. 2. The teaching/learning sequence for conceptual knowledge in many science curriculums

elite few, who become regarded as successful, and a majority, who are seen as failures and who reject science as being full of abstractions having little to do with phenomena in which they may indeed have an interest.

4. Science curriculums for the junior high and elementary levels were designed in a derivative way from this new thinking about the nature of science and its content for learning at the high school level.

Thus a number of projects around the world emphasized (a) the learning of science concepts at even very young ages (i.e., Concepts in Science, the Science Curriculum Improvement Study), and (b) the learning of *processes* of science—intellectual operations that scientists certainly use in their work but which in real life are never disembodied from the content of actual scientific phenomena in the way they were by these student projects. Numerous projects—ESS and AAAS Science (a process approach in the U.S.) and their derivatives around the world, Nuffield Primary Science and its derivatives, Science 5–13 Britain, and many other international projects—sought to provide meaningful learning for all through a curriculum that was based on these intellectual processes, which were then largely ignored by secondary school science teachers, who did not see them as useful tools for transmitting large amounts of factual and conceptual knowledge. They were also quite misunderstood by parents and elementary school teachers, who generally perceived science to be a body of scientific information they had failed to master during their own education.

Consequences of the 1960s and '70s Curriculums

The inadequacy of the earlier attempts to find a meaningful science for *all* levels of students is highlighted by comparing them with the situation in mathematics.

In mathematics, there is universal agreement that facility and understanding of elementary number operations are appropriate and highly desirable goals of the elementary school curriculum. Secondary school teachers want their students to have these facilities. They enhance the students' ability to learn not only the mathematics that secondary teachers want to teach, but also the learning of other subjects in the high school years. Furthermore, secondary teachers are not trained for, nor do they want to teach, these elementary operations. Parents recognize these number operations as familiar and important for their children, both now and in the future. Society and employers add their endorsements to this sort of elementary school mathematics, perhaps more than they should in these days of ready accessibility to other forms of calculation.

No such external recognition and support systems existed for the science curriculums that were introduced in the 1960s and '70s. Hence, those curriculums can be faulted for:

- encouraging the rote recall of a large number of facts, concepts, and algorithms that are not obviously socially useful;
- providing too little familiarity with many of the concepts to enable their scientific usefulness to be experienced;
- including concepts that scientists have defined at high levels of abstraction that are inadequately acknowledged in the school context and hence prevent appropriate explanation of their consequential limitations in real situations;
- involving an essentially abstract system of scientific knowledge, using examples of objects and events to illustrate this system, rather than those aspects of the science of actual phenomena and applications that facilitate some use or control of them;
- using life experiences and social applications only as examples or motivation rather than as the essence of the science learning;
- regarding practical scientific activity (if it is substantial at all) as a way to enhance conceptual learning rather than as a resource for learning essential skills; and
- giving high priority, even in biology, to the quantitative aspects of the sciences.

These curriculums are quite successful in meeting the societal needs I have associated with elite science. In country after country where reformed curriculums have been implemented since the 1960s, the problem of an inadequate supply of scientific and technical person-power has been solved. This is true in developing countries as well as in more industrialized and developing ones. A number of fields are oversupplied.

"It is incredible that a report written in 1983 ['Educating Americans for the 21st Century'] on the need for and role of science education could refer not once to the state of the world environment. It was as if acid rain, dioxin, and continued nuclear testing did not exist."

The main price of this achievement in science education has, however, not been just neutral for the great majority of students who are not, in the end, involved in this elite group. It has been that the majority of students have learned that they are unable to learn science—that science is not for them.

There are other prices also, such as the degree to which the elite have to concentrate their later school years on the study of mathematics and the sciences to the exclusion of a broader curriculum. I would contend also that the elite, despite their concentrated learning of science, are also deprived of many aspects of learning science that have been excluded from their school science courses.

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The Science Curriculum of the Future

This sort of analysis of the curriculum movement of the '60s and early '70s and hence of the present state of science in our schools can be used to begin to define characteristics that may be essential if science education is to be effective as Science for All and other characteristics that are at least worth trying.

First, elite or traditional science education must be confined to and contained within an upper level of schooling. It needs to be identified for what it is: a form of vocational preparation. Containment is not achieved by offering alternatives at the levels of schooling where Science for All is to be achieved. It is no good having a proper science for the few and a science for the rest.

Second, science must be reexamined and recognized as a variegated source of human knowledge and endeavor. A wider range of appropriate aspects of science needs to be selected for converting into the pedagogicial forms of a science curriculum that will have a chance of contributing to effective learning for the great majority of students. This is an epistemological task of a major order. It is, I suspect, a very radical undertaking that is quite beyond the science professionals to whom we have traditionally entrusted it. It is almost impossible to step aside from the intense socialization into science that any of us who are science professionals have experienced. Our ensnarement into science and scientific ways of thinking about the world is too great. For one thing, we have been specialized into only one or two of science's many forms. In addition, our success has transformed us into persons who think about the world and natural phenomena in ways that are quite different from the child at school or the nonscientific adult who may or may not be very successful in our highly technological society.

In order to try to think afresh about chemistry, the area in which I was socialized, I have made a three-dimensional model of the rich corpus of chemistry.

The facets of the model are all aspects of chemistry that chemists recognize as clearly within the confines of their subject. I can walk around it, stand back from it, and look at it. I can even cut through it and look inside. I can see it is about products and raw materials, rich colors and material structures, and involving people at many levels and over time. It affects jobs and careers and materials that clothe and shelter and feed and heal. It involves ideas and concepts and numbers and symbols.

What have we made of this rich complexion of chemistry for schooling? By and large we have reduced chemistry to one of its least exciting two-dimensional transects. School chemistry, apart from occasional visits to the laboratory, is the conceptual transect of this pulsating human adventure with colorful material substances. It is presented black and white on two-dimensional pages of textbooks or on chalkboards. Its learning is checked by students' two-dimensional responses to questions that are presented on two-dimensional test papers.

I have argued that present science curriculums are really an induction into science. The ones that might provide Science for All must involve much more learning about and from science.

These curriculum processes are quite fundamentally different. For instance, in the first we use teachers who have themselves been inducted into an acquaintance with some of the basic conceptual knowledge of an area of science to repeat the first steps of this process with their students. Since the teachers usually have little experience of the exciting practical applications of their knowledge or of the process of trying to extend the knowledge of a science, the induction they offer into the corpus of science is through the same abstract route they followed as part of a former elite who could tolerate it and cope with its learning. Few of their students are interested enough to follow.

In the alternative that I envisage for Science for All, students would stay firmly rooted outside the corpus in their society with its myriad examples of technology and its possibilities for science education. Science teachers, as persons with some familiarity and confidence with the corpus of science, will need to be helped to be not inductors but couriers between the rich corpus and their students in society. As students move through school, their experiences in society (school, home, community) will change, and they will encounter new situations to which science can contribute. Their teachers should dip into the relevant parts of the corpus and, from it, bring to their classrooms the science education that will enable their students to understand their world better and to believe increasingly that science and technology are great human inventions in which they can participate for their own and society's well-being.

Third, some clear criteria must be established for selecting the science that is to be the learning of worth. These also will need to be defined from outside rather than inside and then be ruthlessly applied so that the pressure from the traditional views of conceptual, scientific knowledge can be resisted.

Such criteria should include, for example, (1) aspects of science that students will very likely use in a relatively short time in their daily lives outside of school; and (2) aspects of natural phenomena that exemplify easily and well to the students the excitement, novelty, and power of scientific knowledge and explanation.

At a recent international curriculum workshop in Cyprus these two criteria were used to spell out a skeletal content for a quite new sort of science curriculum. They were found to be logically applicable in a range of broad topic areas such as senses and measurement; the human body; health, nutrition, and sanitation; food; ecology; resources; population; pollution; and use of energy.

In like manner we shall need to explore in the curriculum of Science for All what sorts of pedagogy are appropriate for the sorts of learning these much more variegated aspects of science require. Again we must start from outside science for these pedagogies and consider much more the learners themselves and the constructions they already possess about the natural phenomena we want to teach. Fortunately, this is now a strong field of research in science education, and many of its findings are available. Again there will be an intense and interesting competition if the support teachers need for this type of pedagogy is to get its share of the new science projects' resources.

Learning in Science

Let us consider briefly what we already know of the shape of the new era of science curriculum development, and apply to some of its projects the criteria I have developed for Science for All.

New Zealand science educators in recent years have contributed greatly to our understanding of how children learn science. Unfortunately, in using this as a base for reforming their science curriculum, the New Zealanders seem to have confused science content that was useful to elucidate these learning processes with content that is worth learning as Science for All. Their emphasis on preconceptual knowledge as the learning of worth in the compulsory lower levels of schools will, I am afraid, take its place alongside the conceptual processes of science from the '60s that have been such failures.

In the U.S., the new reform got off to a somewhat disastrous start from the viewpoint of Science for All. The National Science Foundation report on science education[1] that followed *A Nation at Risk* contained some rhetoric of Science for All, but its substance was about the improvement of elite technical education.

It is incredible that a report written in 1983 on the need for and role of science education could refer not once to the state of the world environment. It was as if acid rain, dioxane, and continued nuclear testing did not exist. It had, internationally, a somewhat offensive but perhaps nationally necessary subtitle about making American students' achievements in science education the best in the world by 1995.

This, of course, implies that American science education is not the best in the world now, and that is a refreshingly humble note on which to start. However, to which countries does the report look for its comparisons and targets? To Thailand, which seems to have solved the structural problems of science curriculums better than most and where girls do as well as or better than boys in chemistry and physics? To Tanzania and Kenya, where the idea of personal technology is being used very effectively in school science curriculums? To the Netherlands because they are in the forefront of relating physics learning to society? To Nepal and Sri Lanka, where elementary school science is being used as an effective instrument to enhance the lives of entire families?

No. The comparison that the NSF report contains has a strong sense of déjà vu about it. It is 1957 revisited, but the comparison now is not with the Soviet Union but with Japan, because of the technological and economic threats the Japanese are posing for the U.S. So much for Science for All.

I have not examined in detail all the new curriculum projects that have been sponsored by the National Science Foundation. One entitled Project 2061 does have a strong emphasis in its rhetoric on Science for All. Alas, its mechanism and procedures seem to be yet one more attempt to use the processes that failed in the 1960s. Teams of scientists (excluding science teachers!) are being brought together to try to answer from their blinkered perspectives, "What science do students need to learn?" No nonscientists are included; there is no voice from the many successful people in the U.S. who, in scientific terms, are scientifically illiterate. There is no voice of the dispossessed. It appears again to be a well-intentioned look outward, from well within the corpus of science.

The Secondary Curriculum Review in Great Britain has used as its basic source of ideas and pedagogy the exemplary work of innovative science teachers who have been successful with broader groups of students. This approach seems to have a better prospect of tapping into those outside-of-science views that I see as essential for Science for All. The greater problem for that country, with its propensity for social stratification, is likely to be how to provide recognition that this sort of science is important for all and not just an alternative for those who cannot cope with the "real" sciences of traditional school chemistry, physics, and biology.

Reading the Realities from Past and Present

Science for All is a vision splendid. Like any worthwhile vision, it recurs to lift the spirits of those who have become depressed with what they and others are achieving with current ways of doing things. In the 1930s, Lancelot Hogben's book, *Science for the Million*,[2] offered a vision to educators who began what has been called "the general science movement." In the late 1950s the vision came again and science educators tried again—as part of the science curriculum movement of the '60s and '70s. In the 1980s the vision is clearly before us once more. The shape of the responses to it in the next decade are now being formed. Their adequacy will depend very considerably on how clearly we can read the realities of the earlier attempts and realities of the very different social and educational situations of the current day.

A fundamental difference between the sort of science education (and hence curriculums) that we have had hitherto, and what may be needed for a genuine Science for All is the fact that the "All" must be thought of as existing outside of science. In other words, science is an institutionalized part of all our societies in very definite and varied ways. On the other hand, even in the most highly technical, scientifically advanced societies no more than 20 percent of the population could be even remotely identified with the institutionalized part. The remaining 80 percent are, and for their lives will be, outside of science in this sense. Furthermore, the 20 percent who may, or do, belong within the institutionalized aspects of science also spend much of their lives in spheres of society that are outside of science.

It is this sense of "outside of science" that I think we must understand and translate into curriculum terms if Science for All is to succeed from our present opportunities. ☐

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[1] The National Science Board Commission on Precollege Education in Mathematics, Science and Technology, *Educating Americans for the 21st Century* (Washington, D.C.: National Science Foundation, 1983).

[2] Lancelot Hogben, *Science for the Millions*, 4th ed. (New York: W. W. Norton & Co., Inc., 1968).

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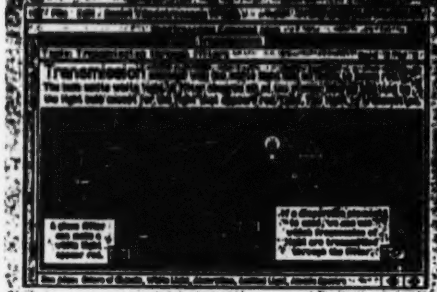
Video and the Computer 8



University of Michigan's Seeing Through Chemistry

Colorado State University's PsychInteract application.

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Reprinted with permission of Syllabus Press, Due for Publication in August 1994, Lynch, Patrick. "Teaching With Multimedia," *Syllabus*, April/May 1992.

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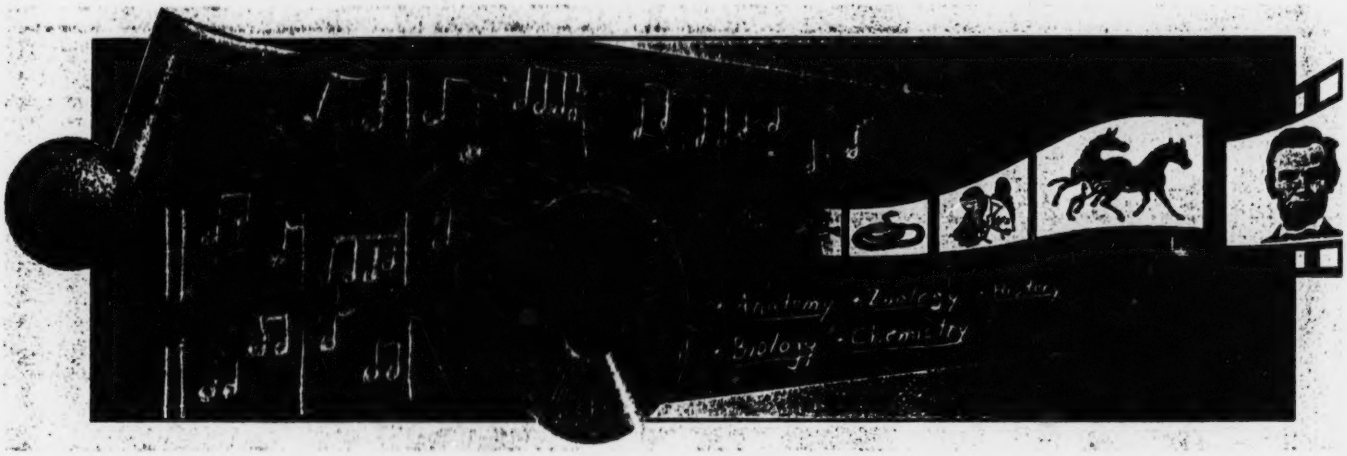
Teaching with Multimedia



Multimedia continues to be a topic of high interest in the academic world. In this, our second annual issue devoted to multimedia, Yale University's Patrick J. Lynch has written four major articles covering multimedia instruction and technology. The first article, "Multimedia in the Classroom," covers the use of multimedia in lectures and presentations, collaborative learning, and individualized learning. The second, "Instructional Design and Multimedia," discusses courseware design strategies. "Developing Multimedia" provides an overview of steps in the development process followed by a discussion of the social restraints on multimedia teaching. Finally, "Video and the Computer" is an introduction to incorporating laserdiscs and QuickTime into courseware.

MULTI MEDIA

Educational projects on the computer have a mysterious air to them, primarily because the technology is often unfamiliar. Without a basic understanding of software and hardware, the results can look like magic—interesting, but unattainable. Unfortunately, the technical and marketing jargon that surrounds multimedia often hurts the new author more than it helps.

Overcoming the Buzzwords

Along with "new media," "hypermedia," and "integrated media," the term "multimedia" has been picked up by the marketing world to describe virtually any conjunction of media on the computer screen, no matter how prosaic. These terms surrounding computerized text often obscure the fundamental similarities between documents on the computer screen and conventional print publications.

At heart, a multimedia document is much like any other document you have created—with text to be written and edited, illustrations to be created or collected, and the footnotes, annotations, indexes, and bibliographies you would expect from any scholarly work in your domain of expertise.

Multimedia can best be defined as various combinations of text, graphics, sound, video, and animation that are controlled, coordinated, and delivered on the computer screen.

Multimedia also implies interactivity, where the user is actively engaged in the presentation of information, and is not just a passive observer of a fixed procession of sights and sounds.

Components of Multimedia

Educational multimedia projects may incorporate interactive audio and video from a videodisc player, digital audio or digital video clips stored on a hard disk, or audio playback from a CD player controlled by a Macintosh computer.

Some presentations combine visual media on a single computer screen, but many interactive videodisc projects use two screens; one for the computer, and a separate video screen for a videodisc player.

All Macintosh computers come with a built-in speaker; in multimedia presentations, this is often supplemented by larger speakers for better sound quality.

Multimedia in the Classroom

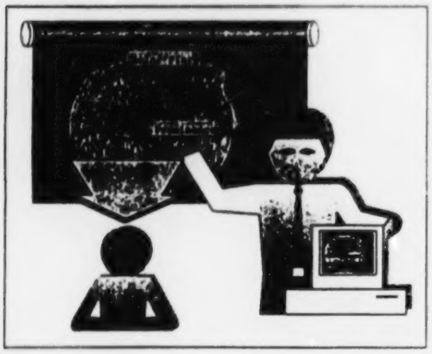
Now that multimedia technology is steadily filtering into most institutions of higher education, we should focus on how best to apply this powerful new educational tool in our laboratories and lecture halls.

The three principal ways in which multimedia technology is used in higher education include:

- at the front of the classroom as a more flexible and versatile update of traditional audiovisual media,
- in student groups for collaborative learning, and
- in individual student use for independent learning.

Regardless of the situation in which multimedia is used, there are profound advantages to teaching in this new medium, advantages that go well beyond easier access to classroom audiovisuals.

Lecture/Presentation



Many educators feel that conventional audiovisual materials remove an important element of spontaneity from their classroom lectures. It is often difficult or time-consuming to back up a slide tray or rewind a videotape, and students tend to become inattentive during long audiovisual examples.

By using interactive media in the classroom, you have instant, random access to both sound and video content. You can compare and contrast different audiovisual examples at will, without having to rewind a cassette tape or search a CD for the passage you need to illustrate a point. Such ready access to multimedia can make classroom lectures a much richer experience for both you and your students.

Well-designed interactive audiovisual presentations can solve many types of educational problems, particularly those that involve dynamic events or processes difficult to describe fully in print or still illustrations, and provide students with a much clearer model of dynamic processes.

Almost any type of process on motion video can be analyzed in slow motion or frame-by-frame, whether the subject is animal locomotion or the destructive testing of new metal alloys. The process can be repeated as many times as it takes for students to grasp the concepts.

Multimedia can also be used to enrich. Using materials such as video, still images, or audio segments from famous speeches, you can make the subject immediate and alive in a way that the printed page never can. Rather than reading dry casualty statistics about a Civil War battle, you could present a superb video such as Ken Burns's Civil War series, where the battle is brought to life through the words and images of participants.

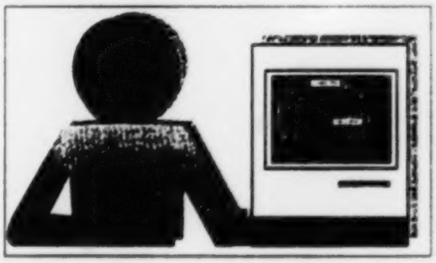
Collaborative Learning

Multimedia can increase the depth and breadth of education, particularly in specialized areas of the curriculum where access to professors (and, therefore, to the subject matter) is limited by the logistics of faculty schedules, the availability of scarce or valuable teaching materials, or maximum class sizes for popular courses.

For example, most medical students do not have ready access to detailed information about diagnostic imaging techniques used in cardiology; these subjects are usually introduced late in a physician's education and are taught by busy clinical faculty members to small groups of residents in cardiology.

Multimedia teaching offers both faculty and medical students a means of packaging this professional expertise, thereby making it widely available to students as well as potentially reducing the time involved for faculty members.

Individualized Learning



As the cost of hardware falls, the use of multimedia with personal computers is becoming more common for individual student use as well.

Educational presentations on the computer provide a private, non-judgmental learning environment; the student controls the pace in a "hands-on" learning experience and can back up, repeat a segment, or ask for further explanations.

Interactive learning on an individual basis helps students of all levels. For quick learners, multimedia offers the opportunity to explore beyond the basics of the course.

For slower learners, individualized learning situations lessen the fear of having to publicly ask for extra help or admit that they "didn't get it" the first time around—events that might otherwise slow down the rest of the class.

Instructional Design and Multimedia

One of the most frequently used terms to describe the advantages of multimedia teaching is that it is "non-linear": students are free to explore content, creating individual paths through the information you provide.

The use of the term "non-linear" is misleading. To many educators it implies an unstructured approach to content that risks leaving the student lost in a sea of undifferentiated information, without the guidance and judgment they expect from a good teacher. In fact, many successful multimedia programs are structured on the same kind of linear, narrative backbone that a print publication or conventional videotape might use.

Some of the few studies that have been done on how multimedia course structure affects student comprehension have found that programs that actively control the student's progress (as opposed to unstructured free exploration) and those that frequently test for comprehension are ultimately more effective in raising student test scores.

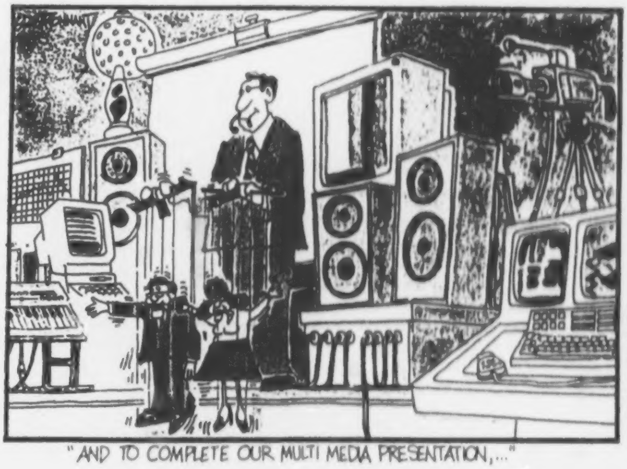
Regardless of how structured your approach to teaching is, you should allow the students to have as much interactive control over audiovisuals as possible, since interactive features correlate with increasing test scores.

Design Strategies

There are several basic design strategies employed in creating multimedia teaching applications. The most common of these include the media manager, hypermedia documents, and simulations.

The media manager: In this design strategy, the computer functions primarily as a table of contents (or menu), listing the audio, video, or animation segments available. In art history classes, for example, the computer may function as an elaborate visual index, helping students locate a rich variety of still photographs of art objects collected on a videodisc. Once you set up the computer to start particular segments of a videodisc or to play selected passages of music, any example is no more than two seconds away.

This design strategy is especially effective in repurposing material from off-the-shelf videodiscs or music CDs, which often contain interesting material but need to be thoroughly cataloged to make such material truly convenient for illustrating your lectures.



"AND TO COMPLETE OUR MULTI MEDIA PRESENTATION,..."

© RICH TENNANT

Hypermedia documents: Instead of just text and still illustrations, you can create an "electronic book" with sound, video clips, animations, or conventional illustrations and photographs scanned into the computer. Often the illustrations themselves are interactive, with pop-up notes or point-and-find tests built into the presentation. A system of links in the software binds text and audiovisual material together into a coherent presentation.

Simulations: These attempt to create the illusion that the student is actually controlling or experiencing the process portrayed. This is especially effective in teaching languages, where students are exposed to "real-life" situations and are expected to play a role in responding to the characters they meet on-screen.

Multimedia is also a powerful tool for simulating lab experiments or introducing materials that are too expensive, too dangerous, or too rare to routinely perform in classrooms or laboratories.

First, video footage of all likely outcomes of a user's actions are recorded (such as a thermometer that shows the temperature rising or falling). Then, based upon the student's responses to the program, the computer determines which videodisc segment best simulates what the user would see in the actual experiment.

Now that computer hardware is significantly cheaper and increasing in capabilities, the costs of computer-based lab simulations may well be less than equipping and staffing some laboratory sessions.

MULTI MEDIA

Developing Multimedia

In many ways, constructing a multimedia project is no different from putting together a paper, monograph, book, or printed course material for your students. You identify a problem, set goals, write an outline, complete a section or two, then get responses from students, peers, or editors on how well you have met your objectives. The following are some of the major steps in the development process.

Identify the Subject Matter

Identifying suitable subject matter for multimedia teaching is the most crucial phase in the development project.

It is natural to gravitate toward those areas of your subject matter that you find the most interesting, but those subjects may already be well covered in your lectures or textbook. When looking for areas appropriate for multimedia, look first for dynamic processes that are not well explained in print or on the blackboard, or complex topics that might be better explained by animation, video, or sound.

Where are the problems? If you have a whole classroom staring at you while you wave your arms trying to explain what can't be shown on the blackboard, that topic could be an area ripe for multimedia teaching.

Explore the Possibilities of the Medium

If you are just beginning to explore the possibilities of multimedia, see as much of it as possible. Talk to fellow educators who have had experience with multimedia or computer-aided instruction projects.

Identify Potential Collaborators and Resources

The range of skills needed to create multimedia teaching programs varies, depending on the complexity of what you want to accomplish and whether you plan to use existing audiovisual material or create your own resources.

Before beginning a project, explore all the available options for on-campus services or resources, including peers and students. Consult your campus academic computing and audiovisual support departments for help and advice. Although this sounds obvious, multimedia computing is still a new area; in many institutions, it may not be clear which departments provide support.

For simple, low-budget projects (or those all-too-common no-budget projects), familiarize yourself with a simple authoring tool such as HyperCard or others described in this issue, as well as off-the-shelf videodiscs, music CDs, and audio or video tapes. For a brief description of some common authoring tools, see the listing beginning on page 6.

For more complex projects, you may need familiarity with computer software, as well as audiovisual skills such as graphic design, illustration, audiovisual production, and interface design. Often, the range of content, design, and audiovisual skills in a large project is more than one person can comfortably handle. Such projects are best done by creating multidisciplinary team efforts that include faculty members, students, and academic support staff.

Determine the Delivery Mechanism

Multimedia does not require expensive color computers. A HyperCard stack running on a basic Macintosh Classic monochrome computer is fully capable of running most multimedia peripherals, such as videodisc players, audio digitizers, amplified speakers, or CD-ROM drives.

Set Realistic Goals

Project management, particularly in such fast-emerging areas as multimedia, is primarily a matter of staying focused on a clear and attainable goal and not allowing your project to be delayed with an endless list of "features."

Multimedia projects need not be complex and time-consuming. The depth and complexity of your needs in multimedia teaching determines how much help you need (if any).

For example, the locomotion mechanisms of many four-footed animals are quite complex, involving the interaction of all parts of the animal's body. Using a conventional video clip of a bounding cheetah might help demonstrate these concepts to your students. By playing the video over and over interactively, or stepping frame-by-frame through the cycle of the cheetah's gait to explore each movement of back, head, and limbs, the lesson is much more likely to leave a lasting impression on the student.

With a Macintosh Classic computer, a videodisc player, and a copy of the Pioneer videodisc Encyclopedia of Animals and Mammals, you could set up such a lesson in about an hour. Or, with a few hours of orientation, you could create a simple HyperCard stack to play video segments from a videodisc player or selected passages of music from an audio CD.

Conclusion

There is almost universal agreement among educators that effective communication of ideas is the core of good teaching. Yet the process of "packaging" information, of spending energy developing and honing the presentation of subject matter, has always been faintly disreputable in higher education. We are instinctively suspicious of material that looks "over-produced," as if any time spent on refining a presentation must surely have been applied to disguise a lack of depth.

In the current competition for scarce academic resources, multimedia instruction could help solve many of the problems of delivering expensive learning experiences, such as laboratory science courses or foreign language instruction. This will happen only if we support and reward faculty members for their work as teachers.

The current limitations on multimedia teaching are primarily social, not technological. We are limited more by lack of a multimedia support and publishing infrastructure than by lack of understanding of the machines themselves.

Computer-based instructional materials are not widely recognized and credited by tenure committees, who discount any work that is exclusively instructional, whether delivered on paper or on the computer screen.

Today some of the most difficult and interesting problems in both commercial competition and academic excellence lie in better managing the sea of information that surrounds us, and multimedia technology is one of the most potent tools we have to help transcend those difficulties.

Perceptions of Environmental Education

⑤

THE AGREEMENT WITHIN THE FIELD OF EE on its definition and goals is not shared by all observers of education. In this section, we present some conflicting ideas about the scope and approach of EE. In one way or another many of the authors in this section feel that EE is not as balanced, effective, or comprehensive as it could be. Surely, all points of view have merit. By understanding the controversies and the areas which need improvement, we are more apt to design better programs.

West, Peter. "Skeptics Questioning the Accuracy, Bias of Environmental Education," *Education Week*, June 16, 1993, pp. 1 and 12.

West reviews some of the issues raised by critics of environmental education. Some complain that EE curricula are designed by environmental interest groups. However, teachers faced with EE mandates and limited resources rely on information provided by both groups environmental and business groups. Teachers and students alike, West concludes, are continually faced with the question, "Whom do I believe?"

Poore, Patricia. "Enviro Education: Is it Science, Civics—or Propaganda?" *Garbage*, April/May 1993, pp. 26–31.

Poore explains several criticisms regarding EE content and curriculum. The typical EE material, she feels, contains repetitive, politically one-sided topics that are filled with assumptions. In addition, the tone of the material is 'apocalyptic,' containing words like: catastrophe, shortage, breakdown, degradation, etc. Questioning the long-term effectiveness of using "guilt and fear as motivators," Poore calls for what she calls a more balanced approach to EE.

Hug, John. "Two Hats" (1977), reprinted in David Engleson (ed), *A Guide to Curriculum Planning in Environmental Education*. Madison WI: Wisconsin Department of Public Instruction, 1985, p. 80.

Hug reminds environmental educators that even though as environmentalists they are advocates, as educators they must be neutral and "value-fair." Hug is currently with the Ohio Department of Education.

Van Matre, Steve. "Environmental Education: Mission Gone Astray," (excerpts from a speech). Institute of Earth Education, Cedar Cove, Greenville WV 24945, 1984.

Van Matre expresses concern regarding the scope and implementation of EE. He feels that, where EE is integrated into curriculum it does not "systematically address what EE set out. . . to accomplish." In other words, we do not simply need supplemental curriculum activities, we need to have both a framework and good activities. Van Matre calls for focused, sequential programs within comprehensive units.

Simmons, Deborah A. "Are We Meeting the Goal of Responsible Environmental Behavior? An Examination of Nature and Environmental Education Center Goals," *Journal of Environmental Education* 22:3, Spring 1991, pp. 16–21.

In this article, Simmons sets the stage for an interesting discussion. According to her research, many nature centers endorse the goal of encouraging environmental behavior yet are uncomfortable or unwilling to encourage many of the practices thought to enhance it. Though Simmons' research focused on nature centers, these *issues also apply to other educators as well. At the very least, Simmons suggests that we continually evaluate our programs to examine the consistency between our goals and means.*

Markowitz, Neil and Ian Robottom. "Evolution in an Environmental Education Course for Teachers," *Journal of Environmental Education* 18:4, Summer 1987, pp. 15-18.
In evaluating their course, Robottom and Markowitz discovered an incongruency. While teachers were investigating controversial issues that required socially critical thinking, they used a traditional process to develop teaching approaches and curricula—the process didn't fit the nature of the content. The course then shifted to an action research approach, "a move from the teacher as curriculum developer to the teacher as curriculum researcher." This article illustrates the importance of reflecting on the process of teaching EE. Simply "improving the quantity and quality of instructional material" will not in and of itself fulfill the goals of EE.

Hungerford, Harold R. and Trudi L. Volk. "Changing Learner Behavior Through Environmental Education," *Journal of Environmental Education* 21:3, Spring 1990, pp. 8–21.

Hungerford and Volk suggest that many educators rely on strategies that are too narrow to fulfill the goal of environmentally responsible behavior. The authors suggest that we look beyond the simple and widely accepted model that "knowledge changes attitudes, which change behavior." They cite and present non-linear behavior change models, which include variables such as personal empowerment, ownership, and action strategy skills. Their investigation indicates that these are all components of truly effective EE. For educators, this implies a broad scope of teaching methods.

Gigliotti, Larry M. "Environmental Education: What Went Wrong? What Can Be Done?" *Journal of Environmental Education* 22:1, Fall 1990, pp. 9–12.

Gigliotti critiques the current state of EE. After 20 years, "environmental education has not produced a citizenry that is able and willing to solve today's environmental problems." Essentially, Gigliotti suggests that we have not gone far enough with EE. He envisions EE as a focal point of the entire educational process, producing a citizenry that fully sees itself as a continuous part of the environment.

Skeptics Questioning the Accuracy, Bias of Environmental Education

By Peter West

As scientists begin reassessing the nature and severity of such environmental conditions as ozone depletion and global warming, critics—including some environmentalists—are questioning both the accuracy and the ideological slant of environmental education in the classroom.

News accounts in recent months have highlighted the growing debate within the scientific community over whether the Earth really is growing warmer as a result of human activity and to what extent the planet is threatened by the thinning of its protective ozone layer.

Meanwhile, critics say that the information young people receive on these and other environmental issues through the media and in school too often is outdated or of questionable accuracy.

Moreover, they say, it tends to promote the activist agendas of the groups that develop the curriculum materials that, given the scarcity of environmental-education textbooks, often are the sole source of information.

"The biggest problem is that there's a vacuum, and the environmental lobbying organizations have been very good at filling that vacuum," said Jonathan Adler of the Washington-based Competitive Enterprise Institute, a conservative research group. Mr. Adler recently criticized the quality and tone of many environmental-education efforts in the editorial pages of *The Wall Steet Journal*.

Corporate interests also flood teachers' mailboxes with "science based" materials on environmental issues, ranging from the cleanup of the 1989 oil spill by the tanker Exxon Valdez in Alaska's Prince William Sound to the virtues of steel recycling.

David Baretz

Though bombarded with "green messages" in the media, students' knowledge of the environment is often superficial, Jane L. Person says.

"We have a great number of industries that are producing materials to use in the

Continued on Page 12

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Reprinted with permission of Education Week, Due for Publication in August 1994, West, Peter. "Skeptics Questioning the Accuracy, Bias of Environmental Education," Education Week, June 16, 1993.

Critics Question Accuracy, Slant of 'Green' Messages Passed Along in Classroom

Continued from Page 1

classroom," said Linda Knight, an earth-science teacher at Paul Revere Middle School in Houston and the president of the National Earth Science Teachers Association.

"These are, in each case, put forward as materials that are 'unbiased,' but the companies do have vested interests," she said.

Widespread Mandates

Although environmental topics have been a feature of precollegiate teaching since at least the 1970's, in recent years at least 30 states have approved a series of widely varying mandates to infuse environmental education into the curriculum.

California, for example, has made environmental science an integral part of its science framework, encouraging the use of environmental topics to teach scientific principles.

Similarly, Florida is developing a science framework that encourages teachers to use the environment immediately outside their schools as a science laboratory.

In relatively few cases do schools in any state offer a separate environmental-education course. Rather, teachers piece together a variety of available materials to add to an existing science course.

Such mandates may ultimately benefit young people who, though bombarded by "green" messages in the media, have only a superficial understanding of environmental issues, said Jane L. Person, an environmental-science teacher at East Stroudsburg (Pa.) High School.

Ms. Person, who has written a textbook for high school environmental-science courses, said she began her course to help students meet a state education mandate, but also to answer the need for accurate information in the curriculum.

Common Misconceptions

Critics assert that many young people are the targets of poorly written and extremist literature on the environment that turns up in school libraries and in the classroom.

Some common misconceptions or exaggerations contained in readily available environmental materials include:

- Reliance on the internal-combustion engine has only had detrimental effects on the environment. In fact, industrialization, for example, has reduced the dependence on a labor-intensive farming economy, allowing reforestation of former farmlands and a higher standard of living.
- An artificially produced increase in carbon-dioxide levels is precipitating a dramatic global warming. In fact, credible scientific evidence suggests that climatic fluctuations are little-understood, cyclical phenomena; that the Earth's primary "greenhouse gas" is water vapor, not carbon dioxide; and that warming may even be offset by such natural features as cloud cover.
- People living today face unprecedented risks from poor air quality. In fact, air quality has improved measurably over all in recent decades thanks to federal anti-pollution laws and regulations.
- Aerosol-spray products contain chlorofluorocarbons, chemicals that damage the ozone layer. In fact, CFC's were outlawed in the United States in 1978.

'Scaring Kids to Death'?

One prominent critic is Patricia Poore, the editor in chief of *Garbage* magazine, a popular environmental publication. In a special report in the April/May issue, Ms. Poore contends that many environmental materials abandon scientific objectivity in favor of calls for activism.

She notes that many works that are commonly found in school libraries perpetuate outdated and inaccurate assumptions about environmental hazards, and sometimes call for a return to a supposedly idyllic agrarian, pretechnological way of life.

Few textbook companies, she writes, have taken up the challenge to produce science-based texts for enviromental education.

Moreover, she notes, some educational psychologists are concerned over the "apocalyptic" tone of the materials, which tend to ignore the progress made in improving air and water quality in favor of dire pronouncements on the threats posed to humanity by global warming, the "solid-waste crisis," or ozone depeletion.

Mr. Adler voices similar views. "Kids are being scared to death. Kids are coming home crying" from school lessons on environmental issues, he asserted. "Most environmental materials certainly don't give an optimistic view of the future of humanity."

And, these critics add, young children, the audience for many of the environmental messages in the mass media, are poorly equipped to weigh the nuances, uncertainties, and even miscalculations that characterize the scientific process.

Alan Sandler, the education director for the American Architectural Foundation, which produces materials that focus largely on the human-created environments of urban areas, conceded that a few materials may indeed contain factual errors.

> *"Environmental education is not like science. There's not a 'right answer in the back of the book.' "*
>
> – Alan Sandler

Yet, he said, critics who focus solely on the scientific aspects of environmental education fail to understand that the topic often spills out of the science curriculum into the social sciences and other areas.

"Environmental education is not like science. There's not a 'right answer in the back of the book,' " he said. "We're trying to deal with the consequences with human behavior, and many times we are not aware what those will be."

Information Overload

Educators must also contend with environmental misinformation that seeps into the curriculum from popular books and the media.

John Padalino, who heads the National Science Teachers Association's task force on environmental education, held a press conference last fall during an N.S.T.A. regional meeting in New York to point out that many popular children's books and comics, such as the Teenage Mutant Ninja Turtles' "ABC's for a Better Planet," contain the error about CFC's.

The press conference, supported in part by the aerosol industry, was designed to counter "the myths that are perpetuated in this country" and in the classroom, Mr. Padalino said.

"There's a lot of junk [science] that works itself into the curriculum," he acknowledged.

Chas Geer

David Baratz

Jonathan Adler, top left, says many of the environmental lessons taught in school these days constitute "indoctrination," not "education." Mark Koker, left, believes precollegiate science "often tends to ignore the nature of risks and . . . the whole issue of scientific tentativeness." For Jane L. Person, the issue can be summed up with one question: "Who do we believe?"

The N.S.T.A., meanwhile, has elevated the environmental-education task force into a standing committee to reflect the importance of the subject in the curriculum.

Observers agree that there are programs that do a good job of examining the scientific questions surrounding such potential environmental hazards as ozone depletion, solid-waste management, global warming, and air and water pollution, particularly at the high school level.

But they say that many elementary and middle school teachers find that the information overload, coupled with the complex and continuously developing state of environmental knowledge, makes it difficult to present a coherent and balanced picture of the nature of an environmental problem in a typical class period.

Those strictures, they say, often lead to the promulgation of simplistic, sometimes inaccurate, views of the state of the environment that fail, for instance, to take into account the vastly improved standard of living in this century that has as one of its costs some level of environmental degradation.

Precollegiate science "often tends to ignore the nature of risks, and risk analysis, and the whole issue of scientific tentativeness," said Mark Koker, the assistant director of the Chemical Education for Public Understanding Program, or CEPUP, a middle-school-level environmental curriculum. Developed at the Lawrence Hall of Science at the University of California at Berkeley, the program is designed to foster informed, science-based decisionmaking.

Urging Advocacy

Political action, not good science, is too often the goal of environmental materials, Mr. Adler and others contend.

Too often, Mr. Adler said, children are encouraged to join letter-writing campaigns to influence political ends, rather than to examine both sides of environmental issues, such as weighing the detriment of smog against the advantages of ready access to automobiles.

"Were this done with any other issue, public figures and parents would be up in arms," he said. "The question is, 'Are schools for education, or are they for indoctrination?' "

One brochure that urges political action is issued by the environmental lobbying group Greenpeace.

"Let's Call Ourselves Greenpeace," a brochure aimed at children ages 6 to 13, is distributed through the organization's "activist network," a grassroots coalition some 22,000 volunteers that includes some teachers. The booklet urges children to write to the chairman of the Du Pont Company, which produces CFC's for sale abroad, to "stop making chemicals that eat away the ozone layer."

One issue of another Greenpeace publication called "Kids Alert" encourages children to write to officials of the People's Republic of China to demand that that country stop testing nuclear devices and to write letters to President Clinton urging him to "start using sun and wind power instead of nuclear power plants."

Kyle Halmrast, who coordinates the activist network, said the materials are designed to encourage children to think about environmental issues, perhaps as a precursor to future activism, and to serve as a counterbalance to materials put out by corporations to defend their practices.

To say that the wide and diverse array of environmental groups that produce classroom materials are bent on creating environmental radicals is not true, he said.

'Who Do We Believe?'

Spokesmen for environmental groups further argue that letter-writing campaigns and similar political activities promote good citizenship in areas that interest children.

"These issues can be good opportunities for children to learn about the political issues and to tie into the political process," said Midge Smith of the education division of the National Audubon Society.

Unlike Greenpeace, the Audubon Society does produce a formal curriculum that tends to focus on natural sciences and human impacts on the natural world, she said.

She noted, however, that as Congress prepares to debate the reauthorization of the Endangered Species Act—a simmering environmental controversy—that Audubon's future educational materials are likely to discuss that debate and possibly to offend those who disagree with the group's stand on the issue.

Teachers, in the final analysis, are frequently left to decide what is biased and what is not in the materials that they choose.

Ms. Person, the East Stroudsburg, Pa., teacher, said she recently showed her students a film, produced by Exxon, on the oil spill in Prince William Sound, which minimized the impact of the spill on the Alaskan ecosystem.

"But there are scientists that are disagreeing with this," she noted. "One of the dilemmas that we have is 'Who do we believe?' "

special report

Enviro Education

Is it Science, Civics — or Propaganda?

BY PATRICIA POORE

ENVIRONMENTAL EDUCATION IN SCHOOLS WAS INEVITABLE. IN AN AGE WHEN SOCIAL issues of all types find their way into the curriculum, environmentalism has become a mainstream political force — one with enough clout to push through legislated mandates. Even in states where this new curriculum is not yet law, parents, teachers, and environmental groups push for classes that address the environment. • A few topics get the lion's share of time, among them planting trees and assessing the biodegradability of various packaging materials. "Recycling's real big: In education today, the thing is action," says Dr. Marc Lame, currently chairman of the Governor's Advisory Council on Environmental Education, operating from the Arizona Department of Environmental Quality. "I think it's good: You can't have awareness without action. Recycling is the glitz, a vehicle for teaching, because the kids like to go out and do something."

Other prominent educators, too, see no problem in crossing the line from science to social issues. Dr. Howard Sullivan, a professor at Arizona State University, has long assessed teaching materials in the fields of energy and economics. What constitutes environmental education today are the "hot" topics: air pollution, especially smog, acid rain, and global warming; water pollution; and recycling.

"Recycling [as a teaching unit] is terrific. Important societal issues, even causes, are more important than knowing the capital of Brazil."

APPARENTLY, ACCEPTANCE OF A NEW "ENVIRONMENTAL CURRICULUM" is nearly universal among parents, teachers, students, environmentalists, and even educators in academia. So let's leave aside the argument that environmental science has been taught all along, as "natural science," "earth and space science," "ecology," and in biology and chemistry classes. Where are the new course materials going to come from?

"Schools have no choice, so they take what they can get their hands on," offers Dr. Robert Melnick, a policy analyst specializing in the environment with the Morrison Institute at Arizona State University. "I have no stats, but, from my research, I would say that [educators and state legislators] made a leap of

ILLUSTRATION BY BETSY EVERITT

Reprinted with permission Dovetale Publications, Due for Publication in August 1994, Poore, Patricia. "Enviro Education: Is it Science, Civicor Propaganda?" Garbage, April/May 1993.

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faith that the market would respond to mandates."

Most state mandates say that each district must adopt environmental education and integrate it into the curriculum. No one has to develop a stand-alone course, necessarily, but rather use the environment as a vehicle to teach.

The "integrated" nature of environmental education may be one reason why traditional textbook publishers have not rushed to create course books. Instead, in the majority of school districts that have not been the recipients of educator-prepared curriculum materials, teachers so far rely on a patchwork of published materials, including magazines, trade paperbacks (published for the general bookstore market), and newsletters from conservation organizations. Videos, almost exclusively from nontraditional "educators" such as Disney and Turner Broadcasting, round out the curricular materials.

Books aimed at children too young to have a strong science background skip straight to activism.

SAVE
THE
EARTH
BETTY MILES

Trade Publishing: The Unofficial Curriculum

SOME EDUCATORS QUESTION WHETHER THE COMbination of commercial publishing and activism is the best way to develop a new curriculum. The truth is, excellent published materials exist which present environmental topics in clear, science-based, unpoliticized text that appeals to a child's curiousity and sense of wonder, rather than eliciting fear and a call to activism. But I had to look hard for them.[1]

Perusing our library's collection of "environmental" books for children, sent to us for review and by definition those most heavily promoted by their publishers, I was struck by the repetitive topics, the emphasis on social problems rather than science background, and the call to activism.

A numbing display of depressing photos, and contents pages enumerating eco-disasters, are the "hip" alternatives to ecology basics.

Consumer books, including the ubiquitous *50 Simple Things Kids Can Do to Save the Earth*, are finding their way into the classroom in the absence of approved and educator-reviewed textbooks. "There are a lot of trade books — children's nonfiction — on environmental topics," says Trevelyn Jones, editor of *School Library Journal*. "They go into public libraries and school libraries, and kids use them to research and write reports. Yes, some of them do make their way into the classroom."

Perhaps most significant in these books is what's *not* included: Every chapter devoted to elephant extinction or garbage crowds out a rich array of important environmental basics. Perpetuation of outdated assumptions is rampant in what is included. Throughout the materials I reviewed, the following assumptions were nearly universal:

(1) Garbage is a major environmental problem, especially packaging, especially plastic packaging. Landfills leak and pollute water, incinerators spew toxic air pollution. Therefore, we have to stop buying things that are "over-packaged" and we have to recycle.

(2) There is a hole in the ozone: it is recent and manmade, it is getting worse, and it has to do with CFCS, which chemical companies knew were bad. Thinning ozone will result in increased UV at ground level, which will result in eye cataracts, immune deficiency, and skin cancer for us all. It is probable that UV will damage plankton, therefore interfering with the whole food chain and causing an irreparable catastrophe. Although it already may be too late, we might halt the progression if we stop using aerosols, foam packaging, and air conditioners, or if industry would pay for chemists to come up with a substitute for CFCS.

(3) Global warming is a fact, proven by the hot summers of the 1980s. Technology, cars, greed, and cutting down rain forests caused it. We can mitigate the effects (described in unabashed detail as "scientists' predictions") only through a cessation of industrial activity and population growth.

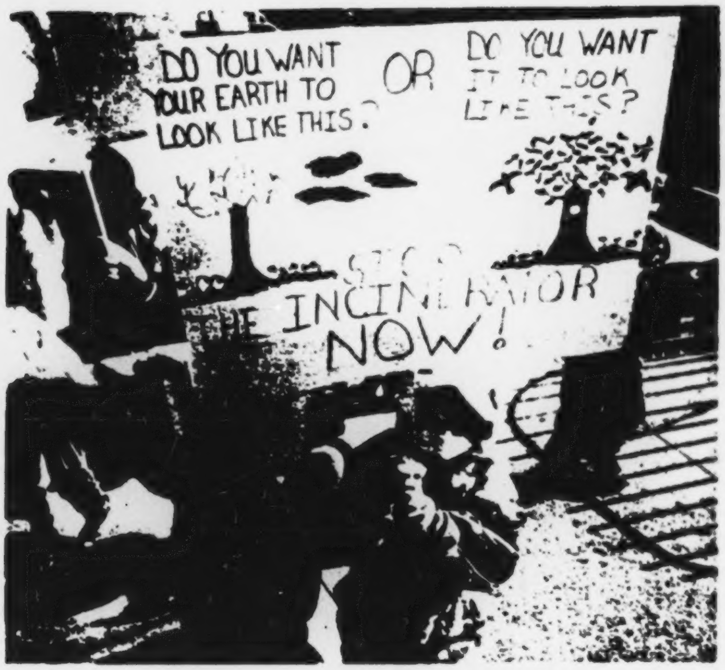
(4) Our food is less nutritious and more toxic than it used to be, because the oceans are polluted (and therefore fish are sometimes poisonous), we ingest pesticides sprayed on fruits and vegetables, and meat is full of chemicals, antibiotics, and hormones that cause cancer and other harm to humans.

(5) If we were all vegetarians, we could feed everyone on earth. It is Western insistence on meat and Western overeating which cause famine elsewhere.

(6) Acid rain is a new phenomenon, and a major cause of manmade pollution. It kills whole forests and makes rivers and lakes too acidic to support life. It is caused by our reliance on electricity, which is created by burning coal. Lessons imply, to children as young as six, that the rain falling outside is dangerous, and that they can help solve the problem by turning off lights.

It's no surprise that the list above echoes common public misconceptions, many of which have been questioned and updated. The release of printed educational material lags behind the evolution of environmental thought. Also, the need for simplicity in writing for young children exacerbates the black-or-white tendencies of environmental rhetoric.

IN MY OPINION, THE PIECEMEAL CURRICULUM, AT LEAST in this initial rush, contains oversimplification and myth, has little historical perspective, is political-


DO YOU WANT YOUR EARTH TO LOOK LIKE THIS?
OR
DO YOU WANT IT TO LOOK LIKE THIS?
STOP THE INCINERATOR NOW!

(Left) Indoctrinated schoolchildren presents a public-relations nightmare. Where will their nightmares go when the inevitable incinerator is built?

NICK MALTER / NY TIMES

ly oriented, and is strongly weighted toward a traditional environmentalist viewpoint, i.e. emphasizing limits to growth, distrust of technology, misinformation concerning waste management, and gloomy (if not doomsday) scenarios.

I am hardly the first to voice these concerns, although I may be the first environmentalist to do so in a magazine article. Dr. Herbert London, then a fellow at the prestigious Hudson Institute, wrote a whole book, published in 1984, after his daughters came home suffering from fears about the end of the world. Entitled *Why Are They Lying to Our Children?*, the book[2] is a heated expose of what Dr. London refers to as lies, gleaned from his study of dozens of social-studies textbooks published in the early 1980s.

Dr. London's book covered several social topics, all of which have been co-opted by popular "environmentalism." Predictably, in a recent interview, he felt things have gotten much worse since the mid 1980s, with the escalation in interest about the environment. "The materials in environmental education have nothing to do with environmental science . . . they are wholly political. The effects [of politicized environmental education materials] are pernicious: It is no longer possible to have a sensible discussion. You cannot talk about historical perspective or risk/benefit or tradeoffs. You have to follow the utopian path.[3]"

Although the worst examples of scholarship show up in the trade paperbacks, Dr. London's criticism is aimed at the underlying assumptions in educator-reviewed *textbooks*.

"The problem with textbook preparation, of course, is that so many interest groups have to be appeased to gain statewide adoption. Environmentalists are a formidable political force, and they monitor textbooks. So some books have striven for 'balance' by giving both sides. Often, that's adequate.

"But there's a classic problem with 'giving both sides,' in some instances. If you had to develop a position between 'the earth is flat' and 'the earth is round,' the discussion would be patently ridiculous."

Critics of the current curricula are not suggesting that recycling is an unworthy topic, or a useless exercise for children to practice. No one has suggested that population growth and food shortages present no dilemma. But I *will* suggest that repetitive topic areas, presented from a single point of view, create a curriculum that is incomplete at best, and misleading and unnecessarily pessimistic at worst. Which brings us to the next section.

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Apocalypse & Advocacy

HALF-TRUTHS AND POLITICS ARE NOTHING new in education, one could argue — although pitfalls are magnified in the environmental arena, well known for its emotional content, political correctness, and call to activism. What is even more striking than the imperfect content of the curriculum, however, is its apocalyptic tone.

Words like menace, catastrophe, collapse, shortage, disaster, breakdown, alarm, degradation, and

Good Planets Are Hard To Find!

On the back cover: "Deforestation, desertification, erosion, famine, smog, acid rain, destruction of natural habitats, contamination of underground and surface waters, extinction of species, acidification of lakes, depletion of the ozone layer, destruction of coral reefs, and logging of the rain forest... . Environmental destruction is our legacy. Time is short. Our situation is critical, and our options are simple. ...We must learn to use less and to recycle more...."

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[1] R.R. Bowker publishes an annotated bibliography of children's books with environmental themes, entitled *e for Environment*, by Patti Sinclair. It is thorough, occasionally critical, and does an excellent job of organizing books by topic area, from nature loving to activism. The hardbound bibliography's 517 titles include fiction, nonfiction, and a handful of titles for adults who work with children: the ages targeted are preschool through age 14. Contact Bowker Customer Service, PO Box 31, New Providence, NJ 07974; (800) 521-8110. Postpaid price, $44.70. [2] *Why Are They Lying to Our Children?*, by Herbert I. London, Stein and Day, 1984. [3] Herbert London followed his treatise on "the problem" with a solution: He wrote *Visions of the Future*, a teacher guidebook and social-studies textbook. Published in 1986, it gives perspective on the past, he says, and does not dwell on pessimistic future scenarios. It has been adopted statewide in North Carolina, Indiana, and Arizona, and is used in other locales around the country.

deadly are ubiquitous. And unlike the singular apocalyptic vision of baby boomers' school days — nuclear annihilation — the sheer number of possible catastrophes terrorizes today's students with a host of disaster-bringing bogeymen: If acid rain doesn't get us, global warming will. Well-meaning people tell me they hope this urgency will propel kids toward positive action. But what if all the doomsaying elicits numbness or, worse, a sense that the future doesn't exist?

"When the FDA put out their call for public comment on bioengineered produce," recounts environmental policy analyst Jonathan Adler, "among the respondents were classrooms full of schoolchildren. Their letters didn't address the scientific or even, really, the ethical issues; they were about death! They called the biotech tomato 'FrankenTomato,' and they pleaded, 'Please don't do this, I don't want to die!'

"The letters were written all at once and they were similar," continues Dr. Adler. "I'd call that brainwashing."

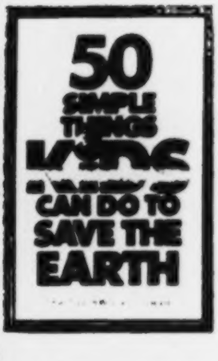
Professor Joseph Adelson, a psychologist at the University of Michigan, years ago conducted studies on the effects of nuclear apocalyptic scenarios on children growing up on them. "I'm almost certain that no one is working on the issue [of the longterm effects of apocalyptic environmental visions on schoolchildren]." Does he plan any such research? "No, it would be a waste of time. The emphasis [on crisis] should be stopped, on the basis of common sense — you don't need a study."

Dr. Adelson is less concerned about the psychology than he is about the quality of education in general. "Politicization goes on in all areas. When it adds up [in the curriculum], it intrudes on the educational process," he states. "The environment is one of dozens of topics today that crowd out real education. You name it, there's a program for it. And in environmental education, as in other [politicized] areas, they teach cliches."

Items describing eco-freaked kids have turned up everywhere, from the *New York Times* to the garbage industry trade journal *Waste Age*, where a recent editorial by the CEO of the National Solid Wastes Management Association describes a letter from a young boy in California. Under the line "Please send information on recycling," the youngster drew a dark cloud shooting six bolts of lightning that hit a tombstone bearing the words "R.I.P. Earth, 0000 B.C. - 2000 A.D. Died of People." Above the cloud, large, squiggly letters warned, "Recycle or Else."

Further down the page, a blue and green heart-shaped planet Earth was ripped jaggedly in half, then shown to be domolished in a fiery explosion.

Mr. Wingerter didn't berate educators, but humbly shouldered the blame. "We in the industry must redouble our efforts to educate the public about waste. . . . public opinion surveys show that many adults seem as uninformed about waste management issues as that letter writer."



A million-selling trade paperback with merit as light reading and an introduction to political environmentalism. But do simplistic pseudoscience and an unchallenged call to kid activism belong in the classroom?

It's Getting Better...

While my search for balance in children's nonfiction went largely unrewarded, excellent curriculum materials, prepared by educators, are recently out or in the works. Among them:

"**The Earth Generation**" educator's guide is an environmental education program for middle- and junior high-school science students; available so far in New York, Michigan, and (soon) Arizona. Regional curricula are prepared by professional educators and the U.S. EPA with the cooperation, in each region, of a corporate partner and an environmental partner. (In N.Y., the partners were Niagara Mohawk Power and the N.Y. Audubon Society; in Michigan, Audubon and Dow Chemical.) The materials are well balanced and refreshingly free of cliche and blame. Activities stress scientific method rather than activism. Teacher guidebooks suggest specific ways to incorporate lessons and activities into the existing regional curriculum. Contact Earth Generation, PO Box 2005, Midland, Michigan, 48641. (517) 631-4010.

Education Development Specialists sells seven units for grades K through 6 (one unit per grade). Every unit covers air, land, water, and energy, but the different units have different focuses. (Conservation of natural resources and air pollution are two examples.) The package is for teachers. It includes a teacher's guide, handout masters, posters, practice exercises, homework, tests, etc. Sometimes schools buy them, but most business is through sponsors (such as the local sanitation district), who then give the curriculum to the schools. Individual units cost $40 plus shipping. Order the four units for K-3 for $120 total, plus shipping. Grades 4-6 costs $95 total, plus shipping. Contact Ann Craftston, Education Development Specialists, 5505 E. Carson St., Suite 250, Lakewood, CA 90713. (310) 420-6814.

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The Alliance for Environmental Education is the largest advocate for environmental education in North America, representing more than 50 million members through its 275 affiliate organizations representing business, labor, governement agencies and other nonprofit organizations. The Alliance has a network of 150 regional centers that develop curricula and conduct teacher training workshops. PO Box 368, The Plains, VA 22171; (703) 253-5812.

The Educational Resource Information Clearinghouse is funded by the U.S. Dept. of Education. ERIC maintains a masive database and library of materials related to science and environmental education, which it abstracts in various publications available to the public. The ERIC staff also produces its own materials. ERIC Clearinghouse for Education, 1200 Chambers Road, Room 310, Columbus, OH 43212; (614) 292-6717.

The EPA List: "Environmental Education Materials for Teachers and Young People (Grades K-12)" is outdated but a starting point for sources. This free 1991 listing of private and public organizations providing educational materials includes brief descriptions, plus addresses and contact names. U.S. EPA, Information Access Branch, Public Information Center, 401 M St., SW, PM-211B, Washington, DC 20460. (202) 260-2080.

Well, of course. The boy from California got his information from adults. Mr. Wingerter granted that the boy's letter was "extreme"; I could tell him it's not unusual.

Raising Little Activists

IF APOCALYPTIC EDUCATION DOESN'T CAUSE DEPRESSION or a live-for-now because there-is-no-tomorrow mentality, it can at least be implicated in a "parental nightmare" — the emergence of what one inflammatory writer called "little green Nazis."

"Star Kist went dolphin safe, McDonalds trashed plastic, Burger King abandoned rainforest beef, and both fast food giants switched to recycled paper bags, in part because they could no longer handle the public relations cost of eight-year-old activists deluging corporate offices with postcard hate mail," explains Mike Weilbacher, host of an environmental radio show in Philadelphia, and a conservation educator. "'Surely, this is good news,' you say? Dig deeper. There's a trend exemplified by the million-seller *50 Simple Things Kids Can Do to Save the Earth*. Among the simple things: 'Ask your parents not to buy products made of rainforest wood.' 'Talk to your parents about getting rechargeable batteries.' 'Ask your principal to buy only recycled paper.' Much of the book isn't really things to do, but things to tell others *not* to do."

Mike Weilbacher is a proponent of environmental education in schools, and wrote of its merits in a recent article in *E* magazine. Still, he declares, "Activists simply don't make good educators, no matter what the cause, for the agenda of an activist is to promulgate propaganda. Period.

"After an Earth Day 1990 kids' concert in New Jersey, whole busloads of schoolchildren were exhorted to 'go home and tell your parents to save the Earth.' Many activists see children as tools, or weapons in the environmental war to reach adult decision-makers. Want to hear something simple? That is obscene," the mild-mannered Weilbacher fumes.

"It must never be our goal to frighten kids into taking pre-determined actions," Mike Weilbacher continued. "[Yet] many environmental education programs attempt to take the express route from awareness to action, promoting teacher-led litter drives or dictated letters to the President. Rare are the occasions when students actually decide, plan, and implement the action step themselves."

America the Gluttonous

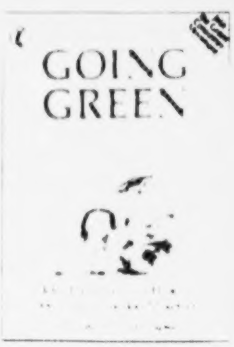
THE EMPHASIS IN ENVIRONMENTAL EDUCATION is on human-created problems of crisis proportion. Those problems are almost always presented as recent disasters created by the productivity of Westerners, especially Americans. Again and again, schoolchildren are admonished that the U.S. has 6% of the world's population, but "uses up" 40% of its resources. Not once, in all the materials I scanned, was it ever mentioned that the U.S. also produces 35% of the world's wealth, which finds its way around the globe. Nor was the question raised, what would the world be like if the U.S. used only 6% of the world's resources?

Children are told that farmland in the U.S. is being lost to housing developments and highways. Never are they told that in 1900, more than 50% of the U.S. population was engaged in farming and that today it is approximately 3 percent, yet output has increased to the point where food is one of our major exports.

The authors of environmental kids' books tell them that Americans have a duty to clean up our act and "save the planet." But they imply that it is an atonement for our sins, not an opportunity and noble obligation. Children are not told that an important reason environmental activism is so prevalent in the U.S. is *because* we have achieved a level of affluence that allows a society to focus on abstract issues, such as the future and quality of life.

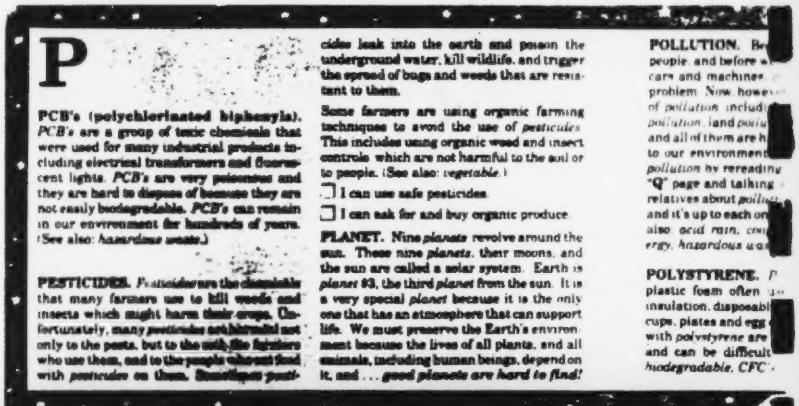
What possible good could come from the numbing repetition of self-defeating, pessimistic messages? I don't advocate a zealously patriotic, love-it-or-leave-it gloss on environmental lessons. But I do question the long-term effectiveness of guilt and fear as motivators. Good effort and results come from children (and a citizenship) who have a healthy understanding of their strengths, pride in past successes, and some sense that the future may be an improvement over the past.

Concludes Jonathan Adler: "If educators approach environmental issues in a balanced fashion, our children won't turn out politically correct. But at least they'll be much more 'eco-smart'." ❦



"Join the Green Consumer Movement," urges the teaser on the cover of this kid activists' handbook.

'P' is for PCBs, Pesticides, Pollution, & Polystyrene in this "environmental dictionary." Hey kids — ever hear of Photosynthesis?



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PCB's (polychlorinated biphenyls). *PCB's* are a group of toxic chemicals that were used for many industrial products including electrical transformers and fluorescent lights. *PCB's* are very poisonous and they are hard to dispose of because they are not easily biodegradable. *PCB's* can remain in our environment for hundreds of years. (See also: *hazardous waste*.)

PESTICIDES. *Pesticides* are the chemicals that many farmers use to kill weeds and insects which might harm their crops. Unfortunately, many *pesticides* are harmful not only to the pests, but to the soil, the farmers who use them, and to the people who eat food with *pesticides* on them. Sometimes pesticides leak into the earth and poison the underground water, kill wildlife, and trigger the spread of bugs and weeds that are resistant to them.

Some farmers are using organic farming techniques to avoid the use of *pesticides*. This includes using organic weed and insect controls which are not harmful to the soil or to people. (See also: *vegetable*.)

☐ I can use safe pesticides.

☐ I can ask for and buy organic produce.

PLANET. Nine *planets* revolve around the sun. These nine *planets*, their moons, and the sun are called a solar system. Earth is *planet* #3, the third *planet* from the sun. It is a very special *planet* because it is the only one that has an atmosphere that can support life. We must preserve the Earth's environment because the lives of all plants, and all animals, including human beings, depend on it, and . . . *good planets are hard to find!*

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Two Hats*

It would appear that environmental educators have a bad case of the "two hat" problem. We have come by the problem naturally and therefore, we have paid little attention to it.

The problem is simply that industry, utilities, labor, business, media and other segments of the population and the general public have consistently recognized only one hat when talking about environmentalists and environmental educators. It is not uncommon for dedicated environmental educators to be summarily dismissed as troublemakers—environmentalists. This one hat view is easily explained because environmental educators are almost always environmentalists. Perhaps definitions will help clarify the problem.

Any world citizen who advocates with greater or lesser action that wrongs against our environment must be stopped is an environmentalist. Perhaps the negative reputation environmentalists have stems from the dramatic and radical actions of a few.

An environmental educator, on the other hand, is any world citizen who uses information and educational processes to help people analyze the merits of the many and varied points of view usually present on a given environmental issue. The environmental educator is not the "mediator," "trade-off specialist" or "negotiator," but a developer of skills and an information analyst who prepares the people (from any segment of the population) who will participate in environmental decision making.

Environmental educators, therefore, need to be as "value fair" or "value free" as they can when working in this role. They must scrupulously strive to get all the facts, examine and illuminate all the viewpoints, and keep from letting their own particular position (as an environmentalist) from mixing with their educator role.

My suggestion is simply that environmental educators make an effort to clarify the two distinct roles. At every opportunity, we should emphasize the neutral nature of environmental education activity. Strong advocacies are all around us, each using the techniques of persuasion and propaganda to build their constituencies. We must ourselves be familiar with all sides, stand firm for each advocate's right to be heard and provide a rational stage for informed debate.

Environmental educators have the right and the duty to be environmentalists, but the dual roles must adhere to the original premise—to keep each hat on its proper head, while utilizing to the fullest the professional skills of the environmental educators.

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* John Hug. Reprinted from *A Report on the North American Regional Seminar on Environmental Educator: A Confrontation with the Issues: Environmental Education for the Real World.* Columbus, OH: SMEAC Information Center, 1977 See Aldrich 1977.

Reprinted with permission of Wisconsin Department of Public Instruction, Due for Publication in August 1994, Hug, John. "Two Hats" (1977), reprinted in David Engleson's, A Guide to Curriculum Planning in Environmental Education. Madison WI: Wisconsin Department of Public Instruction.

"ENVIRONMENTAL EDUCATION: MISSION GONE ASTRAY"

(Excerpts from a speech by Steve Van Matre, Chairman of The Institute for Earth Education and author of Acclimatization, Acclimatizing, Sunship Earth, Earthkeepers, and The Earth Speaks. Steve presents this speech and others at centers and conferences around the world.)

Have you ever noticed that the simplest things in life are often the hardest to say? Things like -- "I love you," "I believe," "Yes," "I'm sorry".... Well, I have a problem like that. I'm working on a new book called Earth Education: A New Beginning, and to be honest, I'm having a lot of trouble with my opening line. How do you say you're sorry, and sound like you mean it, in advance? How do you apologize to those your words may offend even before you say them? How do you adequately explain that you are not attacking the people, but challenging the state of our field?

You see, we think Environmental Education has gone astray -- not because we lack money or facilities or volunteers -- but because we've lost a clear sense of our direction and our mission. And my fear is that any criticisms will sound like we're belittling everything and everyone, or come across like we have all the answers. We're not, and we don't....

However, poke your head into most any school today and see how much real environmental education you find going on there. I don't mean a couple of activities (inside or out) led by one or two valiant teachers, I mean **focused, sequential,** instructional **programs** as a regular, integral part of the whole curriculum. Not much luck? Try the teachers' closets. That's where you'll probably find the most evidence. Look for the now unused books, boxes, pouches and kits that were once common to our field, plus the obligatory mimeographed curriculum guide. Chances are good that most of it gets very little use these days.

And if a few teachers do include an environmental lesson or unit, chances are good that they do not systematically address what environmental education set out in the beginning to accomplish, i.e., how life functions ecologically, what that means for people in their own lives, and what they are going to have to do to change their lifestyles in order to lessen their impact upon the earth.

Next, stop by your average nature center or outdoor school and see what you find there as well. The name of the place may have changed, but the staff is probably back to identifying the plants, doing tombstone rubbings, taking pH tests, reading the weather gauges, making maple syrup, etc. In other words, they're probably offering a loose assemblage of outside activities (yes, with some sensory awareness experiences from Acclimatization and a few similar environmental games thrown in) all tied together by a schedule rather than a desire to achieve particular learning outcomes.

After you've made the rounds of our educational institutions, sit down and sift through some of the major so-called environmental education programs that were developed. You're in for a surprise. You'll find that several of them didn't even deal with basic ecological understandings, i.e., concepts like energy flow or cycling or diversity. You're asking, "How could someone possibly claim to have a comprehensive environmental education program and not deal directly and effectively with the fundamental base for all life on the planet -- the flow of sunlight energy?" That's a good question. What's amazing is that it's been so seldom asked.

Other projects, as you'll see, dealt with some of the concepts, but never attempted to clarify for their participants how their lives were connected to those concepts, nor suggested that they should examine their lifestyles in light of their new understandings. A couple of projects included a framework, even placed ecological understanding within it, but then provided only a disjointed, random accumulation of not very stimulating activities to get the job done that they had so carefully identified in their organizational structure. As a result, you often got either the activities with no good framework, or the framework with no good activities.

Reprinted with permission of Institute for Earth Education, Due for Publication in August 1994, Van Matre, Steve. "Environmental Education: Mission Gone Astray," (excerpts from a speech). Institute of Earth Education, Greenville, WV, 1984.

It's also going to be pretty obvious in your examination that for some of these projects their activities were created first and their objectives formulated later. In fact, chances are good that any time you find an activity description that claims to accomplish several objectives simultaneously, then you've found an activity that was not developed with a specific learning outcome in mind. Instead, someone probably got a group together to come up with things to do, then figured out what their products were really going to achieve afterwards.

You should also check out how they placed such activities in various subject areas while you're at it. It probably went something like this -- imagine for a moment people sitting around a table commenting upon an activity like making maple syrup: "Well, let's see, they figured out the number of buckets of sap it takes to make a jar of syrup didn't they, so it's a math activity." "OK. And they listened to the sap gurgling beneath the bark, that means it's a science activity." "Don't forget when we told them how the pioneers did it. That's social studies." "True, and they had to write a report on it when they got back, so it fits in language arts as well." Want to guess how someone would justify this as an environmental education activity to begin with? "Well, we discussed multiple forest roles with the kids while they watched the sap boiling down." R-i-g-h-t....

Perhaps the most damaging development though was the assertion you'll find in many of these projects that leaders should use the materials in any way they like. In other words, people should just pick and choose whatever caught their fancy, or whatever happened to fit with what they were doing at the time. Hardly anyone said, "Hey folks, if you're going to be serious about the task of environmental education, then it won't work just to sprinkle a couple of activities around like so much spice. You're going to have to put together some focused, sequential programs to get the job done. Just bagging up a batch of activities and calling them a program is like tape recording a batch of sounds and calling them a symphony...."

In the end, I think we're going to have to face up to it: a lot of otherwise well-meaning people have been misled about the nature and purpose of environmental education. And as a result it's become everything to everyone, and not much of anything to anyone. One of my favorite definitions that appeared in the early days was the one that goes "environmental education is education that is in, about, or for the environment." Gosh, no wonder people got confused. Under that definition, what **isn't** environmental education? And if any of these perplexed folks went off to a national conference looking for some answers, they would probably find everything from orienteering to acid rain on the program. Or in other words, everything from outdoor recreation to environmental studies. It's no wonder that the idea of developing focused, comprehensive education programs seemed to get lost in all of this jumbled potpourri of goals and offerings.

Here's the bottom line: we don't need collections of supplemental curriculum activities. They won't get the job done. We need specific, comprehensive units of instruction for specific settings and situations. Let's develop these focused programs and then go out there and sell them to the boards of education, youth groups, nature centers, adult organizations, park districts, etc. Anything short of this will only further the educational hypocrisy that already exists.

In short, we've given up and started over. Earth education **is not** environmental education; it's an alternative to it. Earth education represents a focused, programmatic approach to helping learners of all ages live more harmoniously and joyously with the earth's ecological systems and communities.

Please don't misunderstand: we don't think our way is the only way to get there, but we do think knowing where we're going and paying attention to how people learn is a big advantage. Nor do we think that everyone should be doing earth education all of the time, but we do think its influence on everything else is inescapable. Finally, we don't mean to belittle everything that's been done in the past, but we do think that many of those in pursuit of E.E. have lost their way.

Again, I apologize for how negative all this sounds, but I think it was Einstein who said, "If you don't know there's a problem, you don't have anything to think about." Believe me, there's a problem. Won't you join us in thinking about it?

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Are We Meeting the Goal of Responsible Environmental Behavior?

An Examination of Nature and Environmental Education Center Goals

DEBORAH A. SIMMONS

The goals of nature and environmental education centers reflect certain purposes and philsophies that guide the development of programs, services, and the physical features of the facility itself. By looking at the goals of these centers nationwide, we can obtain a snapshot of the field as it is being defined and put into action. My purpose in this article is to describe the varied goals of centers throughout the United States and to examine the degree to which they are consistent with the generally accepted goals of the field of environmental education. I especially focus on the process of meeting the commonly expressed goal of encouraging environmentally responsible behavior.

Throughout the development of environmental education, goals have been widely described and debated in the literature (Harvey 1977; Childress 1978; Disinger 1983; Volk 1984). Early on, Stapp et al. (1969) proposed that environmental education should work to develop a citizenry that "is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution." Similarly, a set of guiding principles were developed as a result of the Tblisi conference (Jeske 1978, p. 17): "to foster clear awareness of, and concern about economic, social, political and ecological interdependence in urban and rural areas; to provide every person with opportunities to acquire the knowledge, values, attitudes, commitments and skills needed to protect and improve the environment; to create new patterns of behavior of individuals, groups and society as a whole towards the environment." Finally, Hungerford, Peyton, and Wilke (1980, p. 43) presented a "superordinate goal" for environmental education: "to aid citizens in becoming environmentally knowledgeable and, above all, skilled and dedicated citizens who are willing to work, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment."

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Goals and a Proposed Behavior Model

The goals described above all suggest that encouraging environmentally sound behavior is a desired outcome of environmental education. Marcinkowski (1990) goes one step further and argues that not only has responsible environmental behavior been considered a goal of EE, but that "involvement in such activities has often been identified as the terminal goal of EE." In essence, the various goal statements establish a process through which knowledge, attitudes, skills, commitment, and motivation play integral roles in insuring that the terminal goal of *environmentally sound behaviors* can be met. To this end, environmental education as defined in a recent UNESCO document (1987, p. 2) describes a model of action "in which individuals and the community gain awareness of their environment and acquire the knowledge, values, skills, experiences and also the determination which will enable them to act—indi-

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vidually and collectively—to solve present and future environmental problems."

By the use of the phrase "enable them to act," the UNESCO definition suggests a model in which there is a direct relationship between awareness, knowledge, values, skills, and determination *and* the ability of individuals to act on environmental problems. This defined relationship, outlining the role of specific precursors of environmentally responsible behavior, is also supported by a broad range of environment-behavior research. For example, Borden and Schettino (1979) found that environmental behaviors were linked to both a concern for the environment and a general knowledge of environmental issues. In a study of recyclers and nonrecyclers, Arbuthnot (1977) found that knowledge of recycling, a sense of personal responsibility, and locus of control were predictors of recycling behavior. Heberlein and Black (1976) found that those who use lead-free gasoline were more knowledgeable about the issue, expressed a greater concern, were more likely to feel that their personal action could make a difference, and felt a greater sense of personal responsibility than those who did not use lead-free gasoline. Finally, Simmons and Widmar (1989a) proposed that recycling behavior depends upon an individual's sense of responsibility, conservation ethic, knowledge of what to recycle, understanding of how to reycle, and sense of personal efficacy.

In the very least, the individual studies briefly mentioned seem to suggest a number of variables that may be linked to responsible environmental behavior. Going one step further, Hines (1984) synthesized a wide range of environment-behavior research and proposed a model of environmental behavior. Through a meta-analysis of research, Hines suggests that environmental behavior is associated with such components as personality factors (attitudes, locus of control, efficacy perception, personal responsibility); knowledge of issues; knowledge of action strategies and action skills; intention to act; and situational factors (constraints and opportunities). Building upon the Hines behavior model and drawing upon additional research, Hungerford and Volk (1990) have proposed an expanded behavior model. Hungerford and Volk believe that a set of major variables (environmental sensitivity, in-depth knowledge about issues, personal investment in issues, knowledge of and skill in using action strategies, locus of control, and intention to act) and minor variables (knowledge of ecology, androgyny, attitudes; knowledge of the consequences of behavior; and a personal commitment to issue resolution) contribute to responsible environmental behavior.

Drawing from this literature and especially the two models described above, one can suggest a simplified behavior model that would also be compatible with the goals of environmental education. Consequently, for the purposes of this article, this simplified behavior model proposes that knowledge (knowledge of issues as well as knowledge of natural systems), problem-solving skills, and psychological factors (especially attitudes and the development of self-esteem) all contribute to the development of environmentally responsible behavior. The relationship among the contributing variables and environmentally responsible behavior is assumed to be synergistic. Furthermore, the model would suggest that for a program to be successful in encouraging environmentally sound behaviors, it must, to one degree or another, address each of the contributing variables. That is, if a program hopes to encourage environmentally responsible behavior, then knowledge of issues, knowledge of natural systems, problem-solving skills, attitudes, and the development of self-esteem should be included as program-level goals.

In this article, I examine the congruence between the expressed goals of nature and environmental education centers in the United States and the behavior model described above. The analysis provides a description of how the field is being defined by centers, that is, which goals are endorsed and which are not endorsed. More important, however, by comparing the centers' goals with the behavior model, the analysis will give an indication of our effectiveness in meeting the terminal goal of encouraging environmentally sound behavior.

Data Collection

The discussion of goals presented in this article is based on two different sets of data. The first was collected at the 1987 Natural Science for Youth Foundation national conference. Over 100 conference attendees answered 13 open-ended questions that focused on the challenges facing centers, the definition of mission and goals for centers, and the difficulties of developing financial support (see Simmons and Widmar 1989). The questions formed the basis for small-group roundtable discussions. These discussions were tape recorded and transcribed. I have used quotations from the roundtable discussions and the written responses to the questionnaire to illustrate and illuminate the results of the second study described below. These quotations provide anecdotal information on what the goals of centers are and the relationships among them.

The second data set involves information gathered from 1,225 nature and environmental education centers throughout the United States. The center respondents filled out a detailed questionnaire as part of the development of the *Directory of Nature and Environmental Education Centers*, published by the Natural Science for Youth Foundation (NSYF 1990). The questionnaire contained items concerning the center's mission and goals, program, audience, management, and facilities. The individuals filling out the directory questionnaire were provided with a list of goal statements and were asked to rate each item as to whether it was a major

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goal, a minor goal, or not a goal of their center. The survey respondents' answers reflect a broad definition of nature and environmental education centers that includes zoos, aquariums, museums, resident centers, parks, nature centers, and wildlife preserves (Table 1).

Results

Program Goals

Nature study was the most frequently (76.1%) mentioned goal (see Table 2). Significantly more centers indicated nature study than any other goal. The second most frequently mentioned goal was encouraging environmentally sound behavior (74.4%), followed by teaching local natural history (71.5%) and influencing people's attitudes (66%). The remaining five goal statements were each mentioned by fewer than half of the centers as either major or minor goals. It is interesting to note that so few of the centers consider these to be primary goals. Fewer than 15% endorsed disseminating local environmental issues information or helping people develop self-esteem as major goals; only 6.7% indicated that environmental activism is a major goal.

TABLE 1.—Characteristics of the Centers Surveyed, in Percentages

Setting
  Urban (57%)
  Suburban (24.9%)
  Rural (18%)

Audiences served
  Urban (80.9%)
  Suburban (83.7%)
  Rural (71.5%)

  Elementary school groups (95.3%)
  Secondary school groups (85.4%)
  General public (88.8%)
  Youth groups (81%)
  In-service teachers (57.3%)

Ownership/operator of center
  Municipal (12.4%)
  County (13.8%)
  State (15.6%)
  Federal (13.3%)
  Special government district (1.2%)
  Private nonprofit (38.8%)
  Private (industry) (1.5%)
  Private for profit (1.6%)
  College/university (6.7%)
  School system (2.3%)

Programs offered by >50% of centers
  Environmental education (79.7%)
  Wildlife (75.9%)
  Botany (58.8%)
  Ecological science (53.6%)
  Geology (52.8%)
  Aquatic studies (51.6%)
  Science education (50.4%)

Congruence between Expressed Goals and the Behavior Model

The goal statements show both the diversity of philosophies held by centers as well as the underlying similarities. These statements taken alone are of interest, but the information that is particularly enlightening is the degree to which the statements reflect the centers' implicit models of how to encourage environmentally sound behaviors and the roles that the centers see themselves playing in enabling these behaviors. In the following analysis, I examine the goal statements in combination with one another to determine the degree to which the various components of the behavior model have been endorsed (Table 3).

The Role of Nature Study

At the root of the programs surveyed is the importance of studying nature. For some centers, nature study is a goal in and of itself, with the end being greater knowledge of the natural world. For nearly 10% of the centers, the only goal indicated was nature study or teaching about local natural history. Nature study may be seen as a way of instilling appreciation or encouraging preservation. As one participant in the roundtable stated, "Our mission is to preserve and enhance environmental quality through natural science education." Members of the roundtable discussions also suggested that through nature study people could be connected with the environment: "The goal is to reestablish the bond between man and the natural world and thereby establish a concern for conservation"; "You can't build a relationship with nature unless you have contact with the natural world"; that nature study provides a "doorway of knowledge, first-hand experience of the world around us"; and that this direct experience is essential because "you will accomplish more by allowing a little hand to run across the back of a rabbit than with all the words in the world." Thus, nature study can be seen as the foundation upon which a connection with, or appreciation of, the environment is formed.

But although nature study forms a common thread for most centers, other goals may be combined with it to test the degree to which the various components of the behavior model have been endorsed. Sixty-four percent of the respondents indicated that both nature study *and* encouraging environmentally sound behaviors expressed a similar purpose, suggesting that through nature study, environmentally responsible lifestyles could be developed. The participants indicated that they often saw nature study as a way to show the interconnectedness of life and make clear the need for responsible behaviors: "We must teach that human well-being is dependent upon a realization that we are interdependent with all living things and have a responsibility toward

TABLE 2.—Center Goals Indicated by Respondents

Goal	Major goal (%)	Minor goal (%)	Combined total % (major and minor)
Nature study	57.0	19.1	76.1
Encouraging environmentally sound behaviors	50.3	24.1	74.4
Teaching local natural history	46.9	24.6	71.5
Influencing people's attitudes	41.9	24.1	66.0
Disseminating local environmental issues information	13.6	29.9	43.5
Developing environmental problem-solving skills	17.5	23.1	40.6
Helping people develop self-esteem	14.9	16.7	31.6
Environmental activism	6.7	22.1	28.8

TABLE 3.—Endorsement of Behavior Model Components

Model components	Centers endorsing (%)
Nature study + environmental behavior	64.4
Nature study + influencing attitudes + environmental behavior	48.9
Nature study + local issue information + environmental behavior	36.9
Nature study + problem-solving skills + environmental behavior	36.1
Nature study + developing self-esteem + environmental behavior	27.4

long term protection of living systems." One participant proposed that the goal was "to help people understand how life on this planet functions, that man is directly tied to those systems and communities, and that man has to change his lifestyle in order to live in harmony with the earth."

The Role of Attitude Change

Connecting nature study with motivating people to responsible environmental behavior reflects a simple model of how behavior change comes about. This model assumes that there is a direct connection between knowledge acquisition (nature study) and appropriate behavior. Respondents from some centers saw attitudes and attitude change as essential to the role played by nature and environmental education centers. Thus, a combination of influencing people's attitudes and nature study can form an expanded model of how a center might encourage responsible environmental behavior. Approximately half of those surveyed (52%) indicated that nature study, influencing people's attitudes, *and* encouraging environmentally sound behaviors were all goals of their programs (Table 3). One of the roundtable participants suggested that nature study provided an "opportunity for all ages to learn about their relationship to the fragile environment and how their attitudes may help or hinder our future."

The issue of explicitly trying to change attitudes, however, is not embraced wholeheartedly by all centers. Significantly fewer centers listed influencing people's attitudes as a goal, compared with the goals of nature study, encouraging environmentally sound behavior, or teaching local natural history (Table 2). Some find the idea of actively promoting a set of attitudes distasteful. As one roundtable participant asked, "Are you seeing this as presenting both sides of the issue or are you in an advocacy role, because there is a real big difference?" Others seemed to be concerned with the ability of centers to influence attitudes: "The basic issue is people's attitude toward the environment. But it's so nebulous you can't go up to someone and say 'let me teach you about your attitude toward the environment'; it's so mushy you can't get a hold of it so we do all this other stuff—how do you reach a person and move them?"

The Role of Local Environmental Issue Information

If including attitude change as part of the center's goals is not highly endorsed, the other proposed components of the behavior model are even less often included as goals (e.g., enhancing problem-solving skills, increasing self-esteem). Disseminating information on local environmental issues was considered a goal by 43.5%, with *only* 13.6% considering it a primary goal (Table 2). Although the behavior model speaks of the need for people to gain knowledge of environmental issues in order to act, only 36.9% of the centers combine disseminating local environmental issues information with nature study as a means of encouraging environmentally sound behavior (Table 3). Some individuals at the roundtable spoke of the center's role as provider of issue information, serving, as one participant put it, as an "information warehouse."

Once again, however, some centers expressed concern over the need to be seen as an unbiased source of information: "You need to stay current with issues and maintain a certain objectivity so people in the community trust you as a source of information." Similarly, avoiding local environmental issues may be due to a concern over becoming involved with controversial issues: "We tiptoe around issues that have any political overtones. So for us to do programs on even local community environmental issues is something we have to be careful about. And yet, we are the ones that should be doing that. How are nature centers going to do that as money gets tighter and tighter, and we are more and more afraid of losing it by stepping on people's toes or losing governmental support? Is this our role or not?"

It is interesting to note that whereas there was a strong endorsement of nature study (76.1%) as a method of providing a knowledge base, significantly fewer respondents considered disseminating information about local environmental issues (43.5%) as an appropriate method of increasing knowledge. There seems to be a resistance to delving into areas that may have political overtones. The centers appear to be trying to avoid controversy, choosing to define their educational roles narrowly and safely.

The Role of Environmental Problem-Solving Skills

Research has indicated that skills development is an important element in encouraging environmentally responsible behaviors. Hines (1984) stated that "an individual's ability to act is dependent not only upon possessing knowledge of how to act, but also upon an individual's skill in applying that knowledge to the problem. The erroneous assumption is often made that skills evolve naturally from knowledge." Given the importance placed on skill development, it is disappointing that only 40.6% of the centers (Table 2) include developing environmental problem-solving skills as a goal. Even more disappointing, however, only 36.1% see environmental problem-solving skills as being a part of the behavior model that contributes to environmentally sound behaviors (Table 3).

Similarly, few of the roundtable participants spoke, even generally, of the need to help people gain skills to solve environmental problems. One participant suggested that "it is wonderful to raise awareness, but we don't often take that step of tying it into something specific and promoting the skills to keep the environment in a healthy state."

The Role of Developing Self-Esteem

Likewise, few centers focus on helping people develop self-esteem (31.6%). None of the roundtable discussions centered on the role of helping people to feel confident in their abilities to make a difference. Only 27.4% (Table 3) of the centers indicated that increasing self-esteem, nature study, and encouraging environmentally sound behaviors are goals. Although self-esteem may represent only one of a number of psychological factors related to environmental behavior (i.e., locus of control, commitment, efficacy, and so forth), its low level of endorsement suggests that centers are not emphasizing these precursors to environmental behavior in their programs.

The Role of Environmental Activism

Finally, the uneasiness of dealing with attitudes is only intensified when one asks if environmental activism is a goal. Less than one third of the centers considered this as a goal, and only 6.7% considered it a primary goal (Table 2). The question of environmental activism inspired heated discussions at the roundtable, with some arguing strongly that programs needed to promote "action, not just education," and to give people the skills and motivation to "speak up and attend meetings." There was some hope that "some day the kids I educate will speak up when it comes to making decisions about the environment." There was also a recognition of the need to design programs to ensure responsible action: "If we don't consciously try to help people make that transfer, it just isn't going to happen. So many curriculum guides are great until they get to the action segment and then it's totally ineffective. It's not looking at it personally. What can the individual do beyond picking up some litter in the street?" There were those who sharply disagreed with taking any advocacy role: "Our mission is education and not lobbying," and "ours is an education role rather than an advocacy role. We try to present both sides of an issue. We don't take a stand about what we think you should do."

It is noteworthy that significantly more centers endorse encouraging environmental behavior (74.4%)

than endorse promoting environmental activism (28.8%). It seems that environmental activism, with its implied political action, is considered beyond the scope of most centers, whereas encouraging environmental lifestyles is considered appropriate.

Discussion

At the very least, the results illustrate the diversity of programs within the nature and environmental education centers surveyed. Some have defined their purpose in terms of nature study and teaching about local natural history, whereas others see their role as that of a change agent, programming for environmental activism.

Perhaps of greater interest is the apparent inconsistency among the endorsement of various goals. The centers seem to be comfortable with the idea of actively encouraging environmental behavior. Nearly three-quarters of the centers endorsed helping people change their lifestyles. On the other hand, there is considerable resistance to supporting the goals of influencing people's attitudes, disseminating information about local environmental issues, or even helping people develop environmental problem-solving skills. For the most part, centers are endorsing a behavior model that simplistically links nature study directly to environmental behavior.

The question is, however, how can a center enable people to act in an environmentally responsible way unless they are provided with the necessary set of tools? Only 15% of the centers endorsed the full set of goals (i.e., nature study, attitudes, problem-solving skills, local environmental issues information, self-esteem, and environmentally sound behaviors). The results suggest that centers need to examine closely their stated goals and the programs inspired by them. If the centers are among the vast majority endorsing responsible environmental behavior, do their other goals facilitate those behaviors or are they *assuming* that attitudes and skills will develop on their own? If centers truly hope to help people lead more environmentally responsible lifestyles, they must also be prepared to help people acquire the necessary knowledge (both nature study and issue-specific information), attitudes, commitment, and skills.

The results of this study point to the need for continuous, long-term program evaluation. Even though nearly 80% of the centers stated that they are teaching environmental education (see Table 1), most are not explicitly incorporating the goals of environmental education (UNESCO 1987) within the center's goal structure. Moreover, given the research in environmental behavior, one would suspect that those centers providing nature study with the goal of encouraging environmentally sound behaviors are not achieving this goal. Without program evaluations, however, whether a center's goals are being met or not is unknown. Developing an evaluation would allow the center to clarify its goals, identify whether the program provided is consistent with the goals, and determine if these goals are being met.

In conclusion, a word must be said about the limitations of this study. Because of the length of the survey, the number of goal statements provided was kept to a minimum. Consequently, centers were not asked about such potential goals as values clarification or building a sense of efficacy. Additionally, goal statements were not defined for the centers; a goal such as environmental activism may mean very different things to respondents. Whereas some may see environmental activism as implying participation in political activities, others may define it in terms of an organized clean-up campaign. Further research should be designed to clarify these issues.

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Evolution in an Environmental Education Course for Teachers

NEIL MARKOWITZ and IAN ROBOTTOM

ABSTRACT: This paper presents an account of developments in an environmental education course for practicing teachers. The course is open campus (its materials are packaged and sent to distant off-campus students) and has been running now for six years. This account reports some of the changes that have taken place as the course has been taught—changes that are responses to reflections on the course by both faculty and students. The view is taken that deliberate changes in course organization and practice and careful reflection on the outcomes of those changes ought to proceed together in a cyclic fashion, toward an improved understanding of the relationship between the course's theoretical rationale and its practical embodiment. Four such cycles of revision are reported here.

The environmental education course at Deakin University is a component in the University's Bachelor of Education program. This course is generally undertaken by practicing teachers engaged in personal development and improvement of their current qualifications. The course is part of Deakin's open campus program, in which units are presented in written booklet or study guide format complete with support materials (setting out assessment requirements, suggested study schedule, assignment topics, and associated audiotapes and videotapes) in the manner of Britain's Open University courses. The course continues to attract students throughout Australia and the South Pacific region. Enrollment numbers have increased steadily; in 1984 and 1985, some 150 practicing teachers took the course each year.

As explained in a 1982 ERIC case study (Robottom 1982), the Deakin environmental education course has two main elements—a personal development element and a curriculum development element. In the personal development element, students undertake an investigation of a local, current, controversial environmental issue—that is, students educate themselves about a particular, accessible environmental issue. In the curriculum development element, students engage some of the curriculum and teaching issues that arise when, as professional teachers, they attempt to develop and implement an environmental education program in their own schools. It is in the latter element of the course that the greatest changes have occurred over recent years, and it is with these changes that this account is primarily concerned.

The First Cycle of Revision

The first cycle of revision comprised a development of the theoretical base of the course in the light of an exten-

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sive search of the literature of environmental education at local, national, and international levels, and in the light of developments in related courses at Deakin (for example, courses in science education, curriculum evaluation, educational research, and school-based teacher education).

The introductory chapter in the original course materials places the course within the context of international developments reported in the proceedings of UNESCO conferences at Belgrade (1975) and Tbilisi (1977). One of the concepts explicated in the UNESCO Environmental Education Program, and which has become increasingly important in the thinking behind the Deakin course, is that of environmental education as socially critical education. In brief, the argument runs as follows. Socially critical education seeks to engage students in critical analysis of society and social structures immediately, not merely to prepare students for later participation (Kemmis, Cole and Suggett 1983); likewise, environmental education seeks to provide social groups and individuals with an opportunity for active participation in working toward resolution of environmental problems, and to bring educational institutions into contact with the community and to involve them with its concerns (UNESCO 1980). Socially critical education seeks to engage social issues and give students experience in working on them (Kemmis, Cole and Suggett 1983); likewise, environmental education is centered on current practical problems of the environment, advocates "teaching through action," and adopts the view that knowledge, attitudes, and skills assume their full significance in contact with the environment, giving the persons concerned an opportunity to take part in the social decisions that affect their setting (UNESCO 1980). Socially critical education seeks to emphasize social and critically reflective processes (Kemmis, Cole and Suggett 1983); environmental education is similarly concerned, as the quotation below exemplifies (UNESCO 1980):

> Environmental education should not confine itself to disseminating new knowledge but should help the public to question its misconceptions concerning the various problems of the environment and the value systems of which these ideas are a part. . . . All decisions regarding the development of society and the improvement of the lot of individuals are based on considerations, usually implicit, concerning what is useful, good, beautiful and so on. The educated individual should be in a position to ask such questions as: Who took this decision? According to what criteria? With what immediate ends in mind? Have the long-term consequences been calculated? In short, he must know what choices have been made and what value systems determined them.

As this quotation suggests, environmental education goes beyond the exploration of particular environments and beyond the exploration of what realities are constructed by particular individuals and groups at particular times (that is, beyond the ways in which environments are interpreted), to look also at questions about how and why reality comes to be constructed in these particular ways.

Three key features, then, suggest that environmental education can be regarded as a socially critical form of education: its recognition of an interaction between facts and values (expressed in the view of environmental education as a search for the social values and beliefs that justify environmental decisions), its recognition of an interaction between knowledge and action (expressed as a prescription for learning through active engagement of real environmental issues), and its encouragement of collective as well as of individual action in resolving environmental problems. It is argued in the course that, by virtue of its socially critical character, environmental education is a coherent response to the political nature of community concerns about the environment—concerns of the type that actually gave rise to the environmental education movement itself.

This socially critical view of environmental education is in turn informed by a post-empiricist conception of science and of scientific knowledge (Brown 1977). Put simply, knowledge is seen as historically located and socially constructed, because it is influenced by the presuppositions held by the community at a particular point in time—it is permanently provisional. If science and scientific knowledge are understood in this way, then the task of science becomes not one of generating an objective, universally applicable set of theoretical propositions, but the continuing one of attempting to explicate an account of the "theory" (or set of presuppositions) in terms of which scientific practitioners make their work intelligible. It is in this sense that, in a post-empiricist conception of science, "analysis of the logical structure of theories is of much less interest than attempting to understand the rational basis of scientific discovery and theory change" (Brown 1977). It is clear from the UNESCO extract cited previously that environmental education is similarly concerned with a search for the theories—or justifying criteria, or determining values—that inform certain decisions taken in respect to the environment. In this sense, to be environmental is to be interested in attempting to understand the rational basis (search for the justifying values) of current or proposed environmental change.

The Second Cycle of Revision

The second cycle of revision addressed the question, "In the light of this theoretical perspective on environmental education, how coherent is the organization and practice of the course?" From the vantage point of early 1985, the answer to this question was, "Partially, at best."

As described earlier, the course in its original form centered on two assignments: one was a personal development assignment (an investigation of a local, current, controversial environmental issue), and the other was a curriculum development assignment (in which teacher-students address curriculum and teaching issues that arise in the development and implementation of an environmental education program). Course materials support these assignments by providing suggested strategies for carrying out the assignments and associated readings.

The first of these two assignments appears consistent with the developing theoretical perspective of the course; that is, the nature of the assignment is congruent with a socially critical orientation. Students are required, in teams, to carry out an investigation that enables them to (a) develop a portrayal (a case history) of a particular environmental action or exploitation about which there is a division of public opinion; (b) identify the individuals or groups who are most influential in shaping and determining the final outcome of the environmental action or exploitation; (c) construct an account of the assumptions, beliefs, and values that are advanced in justification of certain key actions taken; and (d) indicate their own position on the issue being investigated. Some of the issues investigated in recent years include the following:

1. A proposal to allow waterskiing on the Barwon River in the middle of the provincial city of Geelong. Advocates of the proposal argue for active powerboat recreation in the river; opponents of the proposal argue against the erosion damage caused by powerboating, and for passive recreational use of the river by rowers and others.
2. A proposed toxic waste dump at Avalon (near Geelong). Advocates argue for the need for a dump site to serve the heavily industrial areas to the west of the city of Melbourne; opponents argue for the rights to safety of the residents of Avalon.
3. A proposed "free beach" at Collendina. Advocates favor the secluded spot for nude bathing; opponents invoke religious and other arguments against the use of the beach for nude bathing.

This first assignment is consistent with the developing theory of the course to the extent that it is interested in understanding the rational basis (searching for the justifying values, beliefs, and assumptions) of current or proposed environmental changes. The first assignment adopts a socially critical orientation in its interpretation of environmental education.

The second assignment in the course has been more intensely reviewed. In its original form, the second assignment provided students with a set of "environmental education principles" (a set of guidelines for curriculum development derived from the literature of environmental education), a suggested procedural model for designing issues-based environmental-education curricula, and a number of readings that present activity ideas for environmental education. The assignment required students to formulate their own set of "environmental education endgoals," or long-term objectives, and then to actually design their own environmental education program in a way that (a) was faithful to their own endgoals and the environmental education principles, (b) involved pupils in the investigation of real, controversial issues in their local environment, and (c) was appropriate for the particular circumstances of the school setting in question. The rationale behind this assignment was that environmental education curriculum development should be school-based (Robottom 1982).

So, essentially, the second assignment was one that required students to develop their own environmental education curriculum for the educational setting within which they taught, and within guidelines set by the courseteam faculty. In late 1982, the courseteam faculty made the following reflective comment:

> Experiences gained in operating the course tend to confirm that in environmental education, we are still confronted with such matters as:
>
> 1. the problem imposed by entrenched disciplinary thinking at all levels of formal education for interdisciplinary environmental education;
> 2. the view that a "certain amount" of awareness development (that is, education *about* the environment) is necessary before moving into an investigation of environmental issues;
> 3. the predisposition of environmental education to a conventional, direct style of teaching which acts as an impediment to its aims of developing students' abilities for acting effectively as independent agents in influencing the resolution of environmental problems; and
> 4. the perceived political connotations of an issues-based approach which act as a constraint in the manifestation of such an approach in the classroom.

Two years later, it appeared that we were still confronted with these and other equally fundamental classroom- and school-level problems in environmental education. From the vantage point of early 1985, and based on evidence gained from a survey of past students of the course, the course did not appear to be succeeding in equipping its students to deal constructively with many of the teaching and curriculum problems associated with environmental education. The course needed to be stronger in creating the conditions for teacher-students to engage in an appropriate form of educational enquiry into problems like these. The view of the courseteam faculty was that the two main elements of the course were not fully congruent: while the first assignment adopted a socially critical orientation with respect to its interpretation of environmental education (by virtue of its critical investigation of environmental issues), the second assignment failed to adopt a similar orientation with respect to environmental education (its investigation of teaching and curriculum issues associated with the development and teaching of an environmental education program). In early 1985, it was resolved that the course needed to engage its students more directly in an appropriate form of educational enquiry for environmental education: just as the first assignment adopts a post-empiricist view of knowledge and a socially critical orientation in its investigation of environmental issues, so the second assignment should adopt a post-empiricist view of knowledge and a socially critical orientation in its investigation of educational issues. Thus the question being addressed in early 1985 was, "What form of educational research would confer a degree of coherence between "environmental" and "education" in this course?"

The Third Cycle of Revision

In the second semester of the 1985 academic year, a new approach to the second assignment (formerly the curriculum development component of the course) was first tried. The methodology of "action research" (Lewin 1946) was selected as a form of educational enquiry having the potential to move beyond a curriculum development orientation to embrace a wider notion of educational change and professional improvement—to move from the teacher as curriculum developer to the teacher as curriculum researcher:

> Educational action research is a term used to describe a family of activities in curriculum development, professional development, school improvement programs, systems planning and policy development. These activities have in common the identification of strategies of planned action which are *implemented* and then systematically submitted to *observation, reflection,* and *change* (Carr and Kemmis 1983).

This re-orientation was significant. We had found that the original curriculum development emphasis of Assignment 2 tended to result in students simply cobbling together an environmental education program "on paper" from a number of preexisting curriculum materials, rather than more critically evaluating curriculum materials by testing them out in their own classrooms. In curriculum work based on action research, however, the practioner is required to carry out research on teaching or curriculum issues relating to his or her own professional practice.[1]

The second (curriculum development) assignment for the environmental education course has been reorganized utilizing the action research framework of recurrent cycles of planning, action, observation, and reflection. Now, the assignment has as its first step the selection of an appropriate teaching issue, a decision ideally based on the students' views of environmental education and how environmental education should be taught in schools (this is their emerging "theory of environmental education"). This decision is linked to any dissatisfactions or uncertainties in their own teaching practices; in other words, it is linked to an appreciation of specific curriculum or teaching problems for environmental education in the teacher's particular setting.

Some examples of teaching issues chosen by students in relation to Assignment 2 during 1985 include the following:

1. Classroom management and organization techniques. How can I improve my child-centered approach to environmental education in my Grade 2 class?
2. Exploring the notion of "teacher-as-facilitator." How can I establish a nonjudgmental classroom climate in class discussions about controversial environmental matters?
3. Gender and the teaching of environmental education. How can I move toward equality of educational provision in environmental education in the elementary school?

As a second step, students chose some environmental education curriculum activities or materials that would provide the resource "vehicle" for their teaching/learning activities (planned action). A range of curriculum activities and materials drawn from local sources available to students were suggested as possibilities. Students were then requested to engage in a minimum of three cycles of action research involving the investigation of their teaching issue through the medium of their selected environmental education curriculum activities and materials. (It was later realized that the assignment could potentially encompass more than three cycles of action research.)

The reorganized second assignment was considered more consistent with the developing theoretical perspective of the course; its nature was congruent with the socially critical orientation of environmental education discussed previously. In summary, students undertaking the second assignment were required to

1. conduct an action-research exploration of an environmental education teaching issue through the medium of an environmental education teaching/learning activity;
2. provide a rationale explaining the relevance of their selected teaching issue in relation to their own view of environmental education, and their perceived view of any dissatisfactions or uncertainties in their teaching practice;
3. present an account of the means and outcomes of their observations (data collected through selected monitoring techniques); and
4. prepare a detailed account of the outcomes of their reflections to reveal their understanding of envi-

ronmental education teaching as it emerged from their own classroom experiences.

The action research process of cyclic reflection upon action is seen in this second assignment as adopting a post-empiricist view of knowledge where (in this instance) students' educational actions are recognized as informed by a personal theory shaped by reflections upon practical classroom experiences. Students analyze and systematically revise their conceptions of teaching issues (that is, their emerging theories about environmental education teaching) on the basis of classroom practice. These emerging theories about environmental education teaching provide provisional points of reference on which to base further research into teaching issues in the field of environmental education. Action research seeks to bring about change (in teaching, in programs, in institutions) through a process of identification and critical appraisal of the value structures in terms of which educational actions (by individuals, groups, or institutions) are taken and made intelligible. In this light, action research can be seen as socially critical, and to this extent represents a form of enquiry for Assignment 2 that is consistent with the socially critical investigation of an environmental issue undertaken in Assignment 1.

The revised Assignment 2 was in place in Semester Two 1985, and the outcomes of the change to the course are being carefully monitored. The experiences of 1985 were sufficient to point to some continuing shortcomings of the course. Some of the shortcomings that need to be addressed in future years relate to the pedagogy of the course, its assessment, and (still!) some difficulties with Assignment 2.

Questions of Pedagogy

In striving toward a position of coherence (an alignment with a socially critical view of education) in both the organization and practice of the course, it became apparent that the pedagogy of the course—the nature of the interactions between faculty and students—needed reconsideration. The dissemination of materials (study guides) to open campus students represented a somewhat one-directional model of course communication. A tutorial system available to students in the provincial city of Geelong and in the larger metropolitan area of Melbourne provided additional (albeit occasional) contact with course tutors, but the general orientation of these sessions tended to involve the tutor as a focal point for questions and suggestions, again a primarily one-directional form of communication.

Attempting to move toward a more facilitatory or democratic role, courseteam members in 1985 adopted a pedagogy that attempted to shift the responsibility away from a hierarchical orientation (with course tutors at the pinnacle of the communications pyramid) to a "network" model in which students present their work to peers to solicit critique and further suggestions.

Questions of Assessment

The traditional system of competitive assessment was no longer a defensible choice for the course, considering its developing epistemology. Therefore, a system of noncompetitive, descriptive assessment was implemented. As the course was moving toward a pedagogy that required a much higher level of student collaboration, it seemed inconsistent to place students in a position that opposed the development of such a supportive, interactive "critical community."

Descriptive assessment, on the other hand, seeks to focus the interaction of students and tutors on the individual quality of learning achieved. Descriptive assessment allows the tutor to describe what has been learned in relation to teaching/learning opportunities during the term without placing the student in a framework of competition for marks with his or her fellow students. The position of the course is that assessment ideally should provide a mechanism for communication between student and tutor and should encourage a close, professional relationship offering opportunities for personal and professional growth for all parties concerned. Thus, courseteam tutors as well as students (current and future) have the opportunity to benefit from the insights surrounding course development and improvement that can be a part of the descriptive assessment process.

Continuing Problems with Assignment 2

Students tended to inadequately engage the literature of the field of environmental education, and communications in the course pedagogy continued to rely heavily on course tutors as focal points for insight and critique. In the future, patterns of organization will need to be developed that create conditions for more direct links between students so that learning in the open campus format can move toward a critical community of learners where students rely on peers for support, critique, and insight, as they will need to in their everyday school life.

The Fourth Cycle of Revision

The course is entering a fourth cycle of revision, which will be more formal and more substantial. The courseteam obtained funding from the School of Education for a substantial "Remake" for 1988. Remake status at Deakin enables substantial rewriting of the course, the purchase of outside consultancy time, and typesetting, artwork, and printing assistance for repackaging the course. The structure of the remade course will include a monograph, a task library, and a course newsletter.

The monograph of approximately 100 pages will present a twofold argument. It will argue that environmental education programs (and the students in those programs) ought to adopt a socially critical orientation in the investigation of environmental problems with a view to the improvement of environmental situations; it will also argue that teachers of environmental education ought to adopt a similarly critical form of educational research in investigating the problems of environmental eduation program development and pedagogy with a view to improvement of environmental education teaching situations.

The monograph will argue that considering improvement in environmental education to be simply a matter of improving the quantity and quality of instructional materials misrepresents the educational problem posed by substantial innovations. The monograph will outline some of the issues encountered in changing or improving environmental education in the formal setting. It will discuss the internal tension between "environmental" and "education": the tendency (perhaps because of perceptions about the natural science origins of the environmental education movement) to automatically adopt a science perspective with respect to both the investigation of environmental problems and the investigation of educational problems affecting the teaching of environmental education. The monograph will include an argument for a form of educational research for the teacher of environmental education and attempt to demonstrate what such a form of research might look like.

The task library will comprise a number of tasks from which students choose to do three for Assignment 2 during the course of the semester. A task is made up of a research topic, several readings relating to that research topic, guidelines on educational research, and a detailed statement of the assessment requirements. The task is designed to ensure that students (a) engage some of the literature of environmental education; (b) engage some of the literature of educational research; (c) attempt to involve their own pupils in a socially critical form of environmental education; (d) participate in self-controlled research as they attempt to change or improve their environmental education teaching, or to mount a critique of an existing environmental education curriculum; and (e) think carefully about the relationship between claims made in the literature of environmental education on the one hand and the outcomes of their own research on the other.

As part of the requirements of the course, and based on their own work on the tasks, students will be expected to assess some of the propositions about socially critical environmental education and about socially critical educational research advanced in the course's monograph.

Three issues of a course newsletter will be published for all students in the environmental education course. The newsletter will have two departments, one for the publication of correspondence between students, and one for the publication of abstracts of students' assignments. The newsletter is intended to foster communication between students and between students and tutors, and to assist in the development of a critical community, the members of which can engage and critique each others' research work in environmental education.

NOTE

1. The method of the research comprises recurrent cycles of planning, action, observation, and reflection. There is an initial planning phase in which current personal practice is regarded as problematic, with the teacher involved selecting an aspect of teaching (a "teaching issue") that is a source of dissatisfaction or uncertainty and which suggests there is room for improvement. What is planned in this phase is a teaching/learning activity that has the scope to explore the teaching issue in question. In the action phase, the plan is put into practice in an educational setting. The process of observation requires the selection of monitoring techniques that are capable of detecting or recording the events of the teaching/learning activity in sufficient detail so that any changes or improvements in practice (from the teacher's perspective) can be identified. Examples of monitoring techniques are the use of videotape or audiotape to capture the events of the lesson in a way that can later be studied by the teacher. The reflection phase involves an analysis of the data collected from the process of monitoring classroom events. In particular the reflections should attempt to critically focus on the relationship between the monitored action (teaching practice) and the teaching issue (an aspect of the teacher's developing theory) under scrutiny. The process creates the opportunity for teachers to reassess the relationship between their theory of teaching and their actual professional practice. Such questions: "What changes and/or improvements were evident in my practice?" "Did my action research plan go far enough toward exploring my teaching issue?" and "What further changes and/or improvements to my practice should I attempt in order to more fully investigate my teaching issue?" provide the basis for the planning of the next cycle of action research.

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Changing Learner Behavior Through Environmental Education

HAROLD R. HUNGERFORD and TRUDI L. VOLK

Editor's note:

In March 1990, several United Nations (UN) agencies jointly sponsored a worldwide conference on education entitled "World Conference on Education for All—Meeting Basic Learning Needs" as part of the UN proclamation of 1990 as the "International Year of Literacy." The primary sponsoring agencies were UNESCO, UNDP, UNICEF, and the World Bank. The conference was held in Jomtien, Thailand. All UNESCO member nations were invited to send ministers of education and other representatives. In response, over 100 nations sent delegations, totaling more than 1,500 delegates. These included four heads of state, as well as educational experts and teams from a host of non-governmental organizations.

One of the conference's educational roundtables was entitled "Environmental Education: A Component of Sustainable Development." A number of professionals from different countries were invited to serve on this panel and to prepare papers on selected topics. Dr. Colin Power, UNESCO's assistant director-general for education, served as the panel moderator. Panelists included: Dr. Michael Atchia, chief, Environmental Education and Training Unit, UNEP, Nairobi, Kenya; Dr. Thilla Chellia, Faculty of Education, University of Malaya, Kuala Lampur, Malaysia; Ms. Chodchoy Sophonpanvich, president, Thai Environment and Community Development Association; and Drs. Harold Hungerford and Trudi Volk, Faculty of Education, Southern Illinois University at Carbondale. The papers prepared and topics addressed by the panel were: environmental education; changing learner behavior; introducing environmental education into elementary schools; and the role of non-governmental organizations in environmental education. The paper prepared and delivered by Drs. Hungerford and Volk is published here in its entirety. The views expressed in this paper are those of the authors only and do not necessarily represent those of the sponsoring organizations.

The ultimate aim of education is shaping human behavior. Societies throughout the world establish educational systems in order to develop citizens who will behave in desirable ways. In education, some of the desired behaviors are sharply defined, e.g., skills useful in reading and mathematics. Other desired behaviors are more complex, e.g., successful consumerism, productive employment, responsible citizenship. It is on one of these latter behaviors, responsible citizenship, that this paper is focused. Specifically, this paper will address the effectiveness of environmental education for promoting responsible citizenship behavior.

How might responsible environmental behavior be operationalized? In order to answer this question, we must look to the objectives for environmental education (EE) as defined by the 1977 Tbilisi Intergovernmental Conference on Environmental Education. These objectives, which can be found in the Tbilisi conference declaration (1978), are as follows:

Awareness—to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems [and/or issues][1]

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Sensitivity—to help social groups and individuals gain a variety of experiences in, and acquire a basic understanding of, the environment and its associated problems [and/or issues]

Attitudes—to help social groups and individuals acquire a set of values and feelings of concern for the environment and motivation for actively participating in environmental improvement and protection

Skills—to help social groups and individuals acquire skills for identifying and solving environmental problems [and/or issues]

Participation—to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems [and/or issues]

By using these objectives, we might define an environmentally responsible citizen as one who has (1) an awareness and sensitivity to the total environment and its allied problems [and/or issues], (2) a basic understanding of the environment and its allied problems [and/or issues], (3) feelings of concern for the environment and motivation for actively participating in environmental improvement and protection, (4) skills for identifying and solving environmental problems [and/or issues], and (5) active involvement at all levels in working toward resolution of environmental problems [and/or issues].

The educational task, which is implied by the Tbilisi objectives, is an ambitious one. The citizenship behavior that they describe demands an educational thrust that goes beyond "basic" education in its traditional sense. Instead, we are faced with a set of objectives that paint a broad picture of behavior encompassing not only knowledge, attitudes, and skills, but also active participation in society. The challenge for educators is to translate the Tbilisi objectives into instructional reality. And, since the objectives focus on responsible behavior, it would be appropriate and helpful to consult traditional thinking about behavior as well as recent research into environmental behavior.

Traditional Thinking Versus Research Findings

The traditional thinking in the field of environmental education has been that we can change behavior by making human beings more knowledgeable about the environment and its associated issues. This thinking has largely been linked to the assumption that, if we make human beings more knowledgeable, they will, in turn, become more aware of the environment and its problems and, thus, be more motivated to act toward the environment in more responsible ways. Other traditional thinking has linked knowledge to attitudes and attitudes to behavior. An early and widely accepted model for EE has been described in the following manner: "[I]ncreased knowledge leads to favorable attitudes . . . which in turn lead to action promoting better environmental quality" (Ramsey and Rickson 1977). Both of these models are, in fact, very similar and can be illustrated as shown in Figure 1.

Research into environmental behavior, unfortunately, does not bear out the validity of these linear models for changing behavior. Numerous researchers have investigated a variety of variables hypothesized to be associated with responsible environmental behavior. Many studies have looked at only one variable at a time, and numerous of these have been correlational studies that cannot claim "cause and effect" relationships.

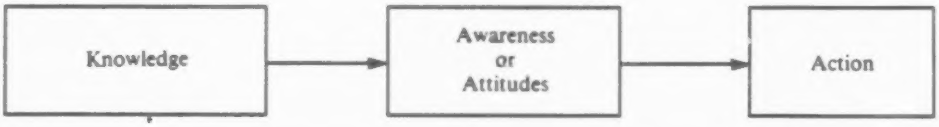
This is not to say that the research in the field has not been productive. Indeed, it has. However, to present a detailed survey of the research literature here would be an enormous task and detract from the major thrust of this document. Let us, at least initially, transcend the bulk of that research by focusing our attention on one particular study which synthesizes the work that preceded it.

In 1986–87, Hines et al. published an important meta-analysis of the behavior research literature in EE. The researchers analyzed 128 studies

> . . . which had been reported since 1971 . . . which assessed variables in association with responsible environmental behavior and which reported empirical data on this relationship. . . . An analysis of data [from these studies] resulted in the emergence of a number of major categories of variables which had been investigated in association with responsible environmental behavior. . . . In the end, fifteen separate variables were meta-analyzed in an effort to determine the strength of their association with environmental behavior. (p. 3)

From this scientific analysis, a model of responsible environmental behavior emerged. This model is dis-

FIGURE 1.—Behavioral Change System



played in Figure 2. In discussing this model, Hines et al. made the following inferences:

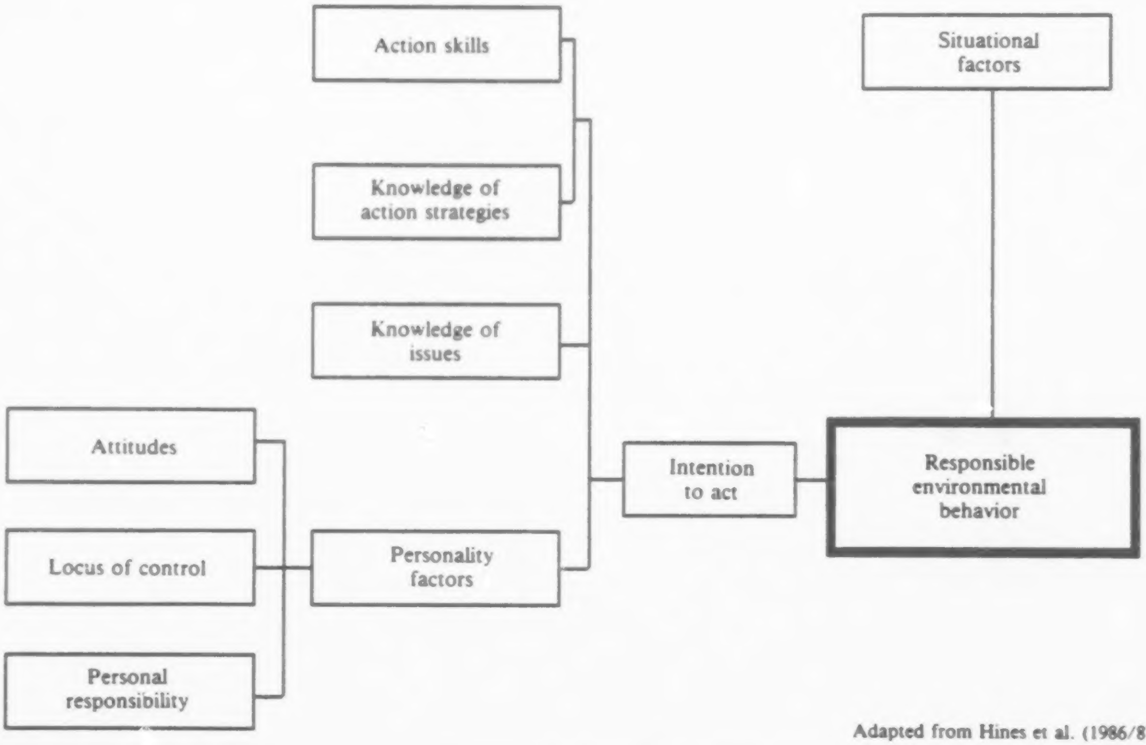
> An individual who expresses an intention to take action will be more likely to engage in the action than will an individual who expresses no such intention. . . . However, . . . it appears that intention to act is merely an artifact of a number of other variables acting in combination (e.g., cognitive knowledge, cognitive skills, and personality factors).
>
> Before an individual can intentionally act on a particular environmental problem, that individual must be cognizant of the existence of the [issue]. Thus, knowledge of the [issue] appears to be a prerequisite to action.
>
> [A]n individual must also possess knowledge of those courses of action which are available and which will be most effective in a given situation.
>
> Another critical component . . . is skill in appropriately applying this knowledge [i.e., knowledge of action strategies] to a given [issue].
>
> In addition, an individual must possess a desire to act. One's desire to act appears to be affected by a host of personality factors. . . . locus of control, attitudes [toward the environment and toward taking action], and personal responsibility [toward the environment].
>
> Situational factors, such as economic constraints, social pressures and opportunities to choose different actions may . . . serve to either counteract or to strengthen the variables in the model.

An Evolution of the Behavior Model

Concurrently with or subsequent to the Hines et al. research, a number of other researchers were making substantial contributions to the literature on behavior (Borden 1984–85; Borden and Powell 1983; Holt 1988; Koslowsky et al. 1988; Marcinkowski 1989; Ramsey 1989; Sia et al. 1985–86; Simpson 1989; Sivek 1989). Some of this research focused on the precursors (predictors) of behavior and some on the outcomes observed from instructional strategies which incorporated a number of the variables from the Hines et al. model.

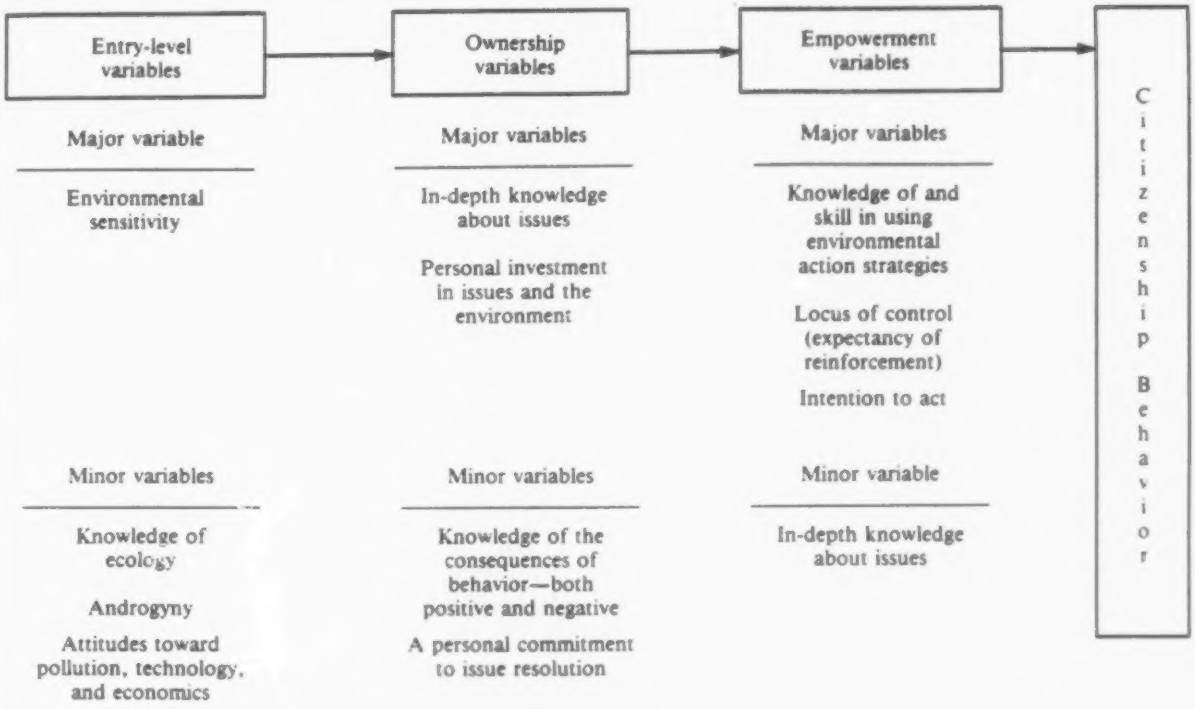
These studies, coupled with the Hines et al. model, revealed that there are probably three categories of variables that contribute to behavior. The variable categories (entry-level variables, ownership variables, and empowerment variables) are hypothesized to act in more or less of a linear fashion, albeit a complex one. These variables are displayed in Figure 3, the behavior flow chart.

FIGURE 2.—The Hines Model of Responsible Environmental Behavior



Adapted from Hines et al. (1986/87).

FIGURE 3.—Behavior Flow Chart: Major and Minor Variables Involved in Environmental Citizenship Behavior


Entry-level variables
Ownership variables
Empowerment variables
Citizenship Behavior
Major variable
Environmental sensitivity
Minor variables
Knowledge of ecology
Androgyny
Attitudes toward pollution, technology, and economics
Major variables
In-depth knowledge about issues
Personal investment in issues and the environment
Minor variables
Knowledge of the consequences of behavior—both positive and negative
A personal commitment to issue resolution
Major variables
Knowledge of and skill in using environmental action strategies
Locus of control (expectancy of reinforcement)
Intention to act
Minor variable
In-depth knowledge about issues

Variables in the Behavior Flow Chart

In the discussion that follows, an attempt is made to describe the variables listed in the behavior flow chart. At certain points, comments are made about the synergistic relationship that appears to exist between certain closely related variables. The reader is cautioned to keep in mind that all of the variables discussed below probably operate in some sort of synergistic manner. While the categories of variables probably operate in a linear fashion, the variables within each category do not necessarily operate in a similar manner. It should also be noted that more research is needed to fully understand the relationships between these variables and behavior.[2]

Entry-Level Variables

Entry-level variables are good predictors of behavior or ones that appear to be related to responsible citizenship behavior. These appear to be prerequisite variables or, at the very least, variables that would enhance a person's decisionmaking, once an action is undertaken. These variables will be briefly introduced here. Subsequently, several will be discussed in more detail.

Environmental sensitivity is defined as an empathetic perspective toward the environment. It is the one entry-level variable that has shown a dramatic relationship to behavior in the research.[3] Given these data, considerable attention must be given by environmental educators to this variable.

Androgyny [in a psychological sense] is a variable that is often associated with individuals who are active in helping resolve environmental issues. Androgyny refers to those human beings who tend to reflect non-traditional sex-role characteristics. For example, an androgynous male may be a very sympathetic individual and able to cry in a sad situation (a traditional female characteristic). An androgynous female, for example, may exhibit certain male characteristics such as assertive behavior. Androgyny is not as strong a predictor as environmental sensitivity.

Knowledge of ecology is listed here because it is almost always prerequisite to sound decisions regarding solutions to issues. "Knowledge of ecology" refers to an ecological conceptual basis for decisionmaking, e.g., concepts associated with population dynamics, nutrient cycling, succession, homeostasis, etc. The research would indicate that knowledge of ecology does not, in itself, produce environmental behavior. Still, it is an important variable when one considers the importance of ecological concepts in decisionmaking.

Attitudes toward pollution/technology/economics are variables that have shown themselves to be significant in some of the research.[4] Although these attitudes appear to be involved with behavior, the extent of their involvement is still unknown and, thus, they are shown here as minor variables.

Ownership Variables

Ownership variables are those that make environmental issues very personal. The individual "owns" the issues, i.e., the issues are extremely important, at a personal level, to him/her. Much of what we know about "ownership" is inferred from a variety of studies. Ownership variables appear to be critical to responsible environmental behavior.

In-depth knowledge (understanding) *of issues* appears crucial to ownership. A number of important studies have addressed this variable.[5] It appears that, before individuals can engage in responsible citizenship behavior, they must understand the nature of the issue and its ecological and human implications. When individuals have an in-depth understanding of issues, they appear more inclined to take on citizenship responsibility toward those issues.

Personal investment in an issue or an action is another variable that we hypothesize to be a major factor in this category. Personal investment is much like "ownership" itself. Here the individual identifies strongly with the issue because he/she has what might be called a proprietary interest in it. For example, an individual who thoroughly understands the economics of recycling and who uses a substantial amount of recyclable material might feel a substantial personal economic investment in recycling. However, the motivation might not necessarily have to be economic. It could be environmental in nature if the person has good ecological concepts about waste disposal, biodegradability and nutrient cycles and understands the broad human involvement in these things. Recycling might, then, become a strong personal need which could be translated as "personal investment."

Empowerment Variables

Empowerment variables are crucial in the training of responsible citizens in the environmental dimension. These variables give human beings a sense that they can make changes and help resolve important environmental issues. "Empowerment" seems to be the cornerstone of training in environmental education. Unfortunately, it is a step that is often neglected in educational practice. A discussion of "empowerment variables" follows.

Perceived skill in using environmental action strategies is one of the very best predictors of behavior.[6] Simply put, perceived skill in using action strategies can be translated as human beings believing that they have the "power" to use citizenship strategies to help resolve issues. Further, these skills are fairly easy to teach to learners.

Teachers trained in this strategy report that students tend to develop a great deal of self-confidence as a result of this training. Training in action skills also results in improved students' self-concepts and a belief that they have been more fully incorporated into society. These are very powerful considerations when making students more responsible citizens in their own communities.

Knowledge of environmental action strategies is a variable that sometimes shows a relationship to behavior in the research (Holt 1988; Klingler 1980; Ramsey 1989; Ramsey et al. 1981; Simpson 1989). The extent to which this variable is separate and apart from "perceived skill in using action strategies" is unknown. It is probable that the skill component is dependent on the knowledge variable to a great extent. Knowledge about action strategies per se is not as powerful a predictor as the skill variable. This explains why these two variables are listed together in the behavior flow chart.

A word of caution may be necessary here. In the studies that examined behavior, learners gained an in-depth knowledge of issues as well as learning about action strategies. It is suspected that these two major variables operate synergistically, not separately. Thus, it would appear unlikely that citizenship action skills taught without issue-related knowledge would prompt responsible behavior in individuals.

Locus of control, although not as good a predictor as perceived skill in using action strategies, is important also, and, like many of the other variables discussed here, this one is probably interconnected with others.

Locus of control refers to an individual's belief in being reinforced for a certain behavior. A person with an "internal locus of control" expects that he/she will experience success or somehow be reinforced for doing something. Success, in turn, appears to strengthen his/her internal locus of control. On the other hand, a person with an "external locus of control" does not believe that he/she will be reinforced for doing something and, therefore, probably will not do it.

An individual who believes that he/she has good fishing skills is more likely to attempt fishing because there is an expectation of success or reinforcement for this behavior. This person has an internal locus of control for fishing. An individual who believes that he/she is powerless to make changes in society probably will not act in a citizenship dimension. There is no expectation of success or reinforcement for acting. This person would have an external locus of control for trying to help resolve environmental issues.

An internal locus of control probably cannot be developed *directly* in the classroom. However, there is research that indicates that locus of control can be improved as a consequence of teaching citizenship action

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skills. An improved locus of control may well result when students have had an opportunity to apply these skills successfully in the community.

Intention to act seems also related to the "empowerment" variable. If a person intends to take some sort of action, the chances of that action occurring are increased. It is likely that this variable is closely related to both perceived skill in taking action and locus of control. "Intention to act" may also share a synergistic relationship with "personal investment," which was discussed earlier under the "ownership" heading.[7]

Goals and Objectives for Instruction in Environmental Education

Behavior in the environmental dimension can be perceived as so very complicated as to make instructional planning difficult. This difficulty (as well as a lack of research into the precursors of behavior and instructional strategies designed to change behavior) probably resulted in the model that knowledge leads to awareness which leads to behavior.

There has been a great deal of criticism about the lack of direction in EE over the past 15 years.[8] The lack of emphasis upon objectives that focused on helping students actually solve environmental problems and develop problem-solving skills is contrary to the recommendations for environmental education objectives contained in both the 1977 Belgrade Charter and the 1977 Tbilisi Intergovernmental Conference Report.[9]

The answer to some of these concerns might be found in instructional goals for environmental education that incorporate the variables related to "ownership" and "empowerment."[10] Such a set of goals was developed in the early '80s and has subsequently been used throughout the world as a guide for curriculum development and research. This set of goals identifies a "superordinate goal" which follows:

> *The superordinate goal:* . . . to aid citizens in becoming environmentally knowledgeable and, above all, skilled and dedicated citizens who are willing to work, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment.

Four major goal levels as well as subgoals were developed to help accomplish the superordinate goal. The goal levels are presented below (the entire set of goals and subgoals is found in Appendix A).

Goal Level I: The Ecological Foundations Level. This level seeks to provide learners with sufficient ecological knowledge to permit him/her to eventually make ecologically sound decisions with respect to environmental issues.

Goal Level II: The Conceptual Awareness Level—Issues and Values. This level seeks to guide the development of a conceptual awareness of how individual and collective actions may influence the relationship between quality of life and the quality of the environment and, also, how these actions result in environmental issues that must be resolved through investigation, evaluation, values clarification, decisionmaking, and finally, citizenship action.

Goal Level III: The Investigation and Evaluation Level. This level provides for the development of the knowledge and skills necessary to permit learners to investigate environmental issues and evaluate alternative solutions for solving these issues. Similarly, values are clarified with respect to these issues and alternative solutions.

Goal Level IV: Action Skills Level—Training and Application. This level seeks to guide the development of those skills necessary for learners to take positive environmental action for the purpose of achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment.

Educating for a Change in Behavior

What Are the Critical Educational Components?

Given all that has preceded this section, one should be able to identify a number of critical components of a total educational program for environmental education if changes in learner behavior are desired. Among these critical components are ones which can be facilitated by formal and nonformal educational agencies (see Table 1).

Comments on Implementing the Critical Components

Certainly, there is no one best way to implement these components in an instructional setting even though the research provides the reader with some meaningful clues concerning important and successful strategies. And it may be that it will take a concerted, cooperative effort among educational institutions to meet the challenge of changing learner behavior. Certainly, an articulated implementation across grade levels and the cooperation of nonformal educational agencies as well as local and regional educational resources would maximize the opportunity for success.

What are some successful strategies for meeting the implementation challenge? What are some cautions that should be kept in mind while implementing the important components? Most of the components listed in Table 1 will be discussed here in some detail. However, first let us focus on at least one overall strategy that seems to be especially critical.

The need for a reinforcement strategy. Educators must not assume that one course or one unit or one year of training will accomplish the task needed even though a number of studies have shown that certain strategies for changing behavior are successful (Holt 1988; Klingler 1980; Ramsey 1989; Ramsey et al. 1981; Simpson 1989).[11] Associated with one of these studies (Ramsey et

TABLE 1.—Critical Education Components

It appears that we can maximize opportunities to *change learner behavior* in the environmental dimension if educational agencies will:

1. teach environmentally significant ecological concepts and the environmental interrelationships that exist within and between these concepts;
2. provide carefully designed and in-depth opportunities for learners to achieve some level of environmental sensitivity that will promote a desire to behave in appropriate ways;
3. provide a curriculum that will result in an in-depth knowledge of issues;
4. provide a curriculum that will teach learners the skills of issue analysis and investigation as well as provide the time needed for the application of these skills;
5. provide a curriculum that will teach learners the citizenship skills needed for issue remediation as well as the time needed for the application of these skills; and
6. provide an instructional setting that increases learners' expectancy of reinforcement for acting in responsible ways, i.e., attempt to develop an internal focus of control in learners.

al. 1981) was an important but unpublished follow-up investigation conducted three years after Ramsey measured the effects of three different treatments on the environmental behavior of eighth-grade students.

Three years after Ramsey completed his initial investigation, he trained several graduate students to act as interviewers and took them to the secondary school where the original subjects were students. The interviewers were trained to assess the extent of student involvement in environmental issues and environmentally appropriate behavior. The interviewers were not told which students had been in the experimental group and which had been in either of the control groups. Interestingly, the interviewers could identify each of the students who had been in the experimental group. The subjects *were involved in more environmentally appropriate behaviors* than their counterparts. However, it was clear that the original behavior observed in the eighth grade had eroded over time. There had been no intervening educational reinforcement for the students over a three-year period. Thus, it seemed obvious that, even though the experimental subjects were more environmentally involved, some sort of intervening treatment would have been needed to maintain the original level of involvement.

In light of Ramsey's follow-up study, it seems obvious that learners need to be reinforced for positive environmental behavior over time. No definitive recommendations about the extent of instructional reinforcement will be made here. There is simply no research to validate how much is needed. However, it is evidently imperative that learners get in-depth educational experiences over a substantial amount of time.

Thoughts on the sensitivity component. Environmental sensitivity is a particularly troublesome variable for many educators who understand its importance. The variables associated with sensitivity are often not associated with formal education.

Several research studies have focused on "sensitivity" (Peters-Grant 1986; Peterson 1982; Scholl 1983; Tanner 1980). These studies yielded similar results concerning the precursors to environmental sensitivity. It appears that "environmental sensitivity" is a function of an individual's contact with the outdoors in relatively pristine environments either alone or with close personal friends or relatives. The environmentally sensitive individuals reported hunting, fishing, and other outdoor activities as important variables. Of great importance is the fact that they reported that these activities took place over long periods of time.

Numerous sensitive individuals reported that some experience with severe environmental degradation substantially increased their environmental sensitivity. Some sensitive individuals reported the importance of teachers who acted as sensitive role models for them. Others reported being raised in an environmentally sensitive social environment. Only a few reported the importance of educational courses or books.

If these research studies are to help us make educational decisions about developing environmental sensitivity, it seems important that learners have environmentally positive experiences in nonformal outdoor settings over long periods of time. And, in the formal classroom, we must look to teachers who are, themselves, sensitive and willing to act as positive role models for learners. Both of these conditions, for millions of learners, are hard to meet.

Accomplishing the issue investigation, action, and knowledge components: two recommended approaches. These variables are collapsed together in this heading because there is research evidence that these can be met simultaneously in a formal instructional setting. (Holt 1988; Klingler 1980; Ramsey 1989; Ramsey et al. 1981; Simpson 1989). In each of these studies, behavior changed positively as a consequence of instruction that focused on ownership and empowerment. Of great importance is the fact that, in all cases, students were shown to participate in more environmentally appropriate behaviors out of school after instruction.

The instruction used in each of these studies focused on the goal levels cited earlier with the exception of the ecological foundations goal. That particular goal (ecological foundations) was met earlier in the learner's schooling. Thus, Goals II, III, and IV were part of the instructional design. In all cases, the instruction involved the use of one of two curricular strategies (Hungerford et al. 1988; Marcinkowski et al. 1990; Hungerford et al. 1990).

Two Curricular Strategies: The Issue Investigation and Action Model and the Extended Case Study Model

In the issue investigation and action model, the student learns to discriminate between environmental events, problems, and issues. The impact of beliefs and values on issues is emphasized, and an issue analysis strategy is introduced and practiced. Students then learn how to identify environmental issues, write research questions focused on these issues, and learn how to obtain information about issues using secondary sources. They also learn how to compare and evaluate secondary information sources. They then learn how to develop surveys, opinionnaires, and questionnaires and how to sample populations in order to obtain scientifically valid information. In addition, they are taught how to record data, interpret the data, make inferences about the data and draw recommendations from these inferences. At this time, each student chooses an issue of particular interest to him/her and investigates that issue in depth. Subsequently, the student prepares a report on that investigation and tenders a written report to the instructor and an oral one to his/her peers.

After the students have completed their issue investigations, they learn the major methods of citizenship action, analyze the effectiveness of individual action versus group action, and develop issue-resolution action plans. This action plan is evaluated against a set of criteria designed to assess the social, cultural, and ecological implications of the action. Finally, the students decide whether they want to actually implement the plan of action. If they choose to implement their action, the instructor helps to facilitate this citizenship behavior.

In the extended case study model, the students learn some of the same skills that were learned in the other model except that they do so focused on a predetermined issue, sometimes chosen by the class but most often chosen by the instructor. The research indicates that the extended case study model, although successful, is not as powerful an instructional model as the issue investigation and action model.

Selected educational characteristics of both models are illustrated in Table 2. The characteristics displayed are for ages 6 to 17 (Grades 1 to 12) only. It is important to note, however, that the issue investigation and action model has been used very successfully with both undergraduates and graduate students in university teacher education programs in the United States.[12]

Effectiveness of Environmental Education around the World

Has environmental education been effective on a global basis? In citing evidence of success, we might point to nations that have made a concerted effort to mount environmental education programs. We might also note the many national and international leaders who are hard at work trying to implement EE. Numerous organizations also advocate and/or deliver environmental education programs. In addition, there are curricular materials from formal and nonformal educational agencies; media campaigns; adult education programs; outdoor education programs; conservation education programs; and other vehicles that attempt, in one way or another, to change human behavior in an environmental dimension.

Evidence of success might also be seen in the numerous stories telling what young students and adult activists have done regarding issues (see Appendix B for examples). Some of these anecdotes have originated from students who have learned issue investigation and citizenship action skills in school. Some of these anecdotes have originated from excellent conservation education programs designed to teach adolescents and preadolescents sound conservation practices. Some have originated from governmental agencies, which are funded to help humans learn how to conserve natural resources. Others come from private agencies that strive to help human beings confront issues and deal responsibly with the environment. Still others originate in agencies that have a major responsibility for environmentally related law enforcement.

Does this wealth of evidence speak to the effectiveness of environmental education? Before reaching that decision, it may be wise to consider additional evidence. We urge responsible citizens and educators to consider three main concerns.

Concern No. 1: We Seem to Be Losing the Battle for the Environment

Regardless of what we as educators would like to think, we can point to relatively few successes that offset the severity of environmental degradation and the serious problems associated with human reproductivity. This is a bitter concept for educators to accept. Although we are prone to defend our practices in EE, we must stop and evaluate how successful we are in the overall battle to resolve urgently important environmental issues. It is not our purpose here to put forward a litany of truly critical environmental issues facing human beings today. But, if we did, this listing would enormously outweigh the successes in changing environmentally related behavior around the world. *Thus,*

TABLE 2.—A Comparison of Two Instructional Models for EE

Characteristics	Model	
	Issue investigation model	Case study model
	Students	
1. Appropriate grade levels	6–12	1–12
2. The student's role in the class	As an autonomous issue investigator	As a researcher in large or small groups
3. The extent to which the student gains an in-depth knowledge of a wide variety of issues	A great extent	A small extent
4. The extent to which the student gains a sense of issue ownership	A great extent	A moderate extent
5. The extent to which the student gains new skills	Very high	Moderate
6. The extent to which the student is empowered to act on a variety of issues	A great extent	A small extent
7. The extent to which one can anticipate student involvement in issue solution outside of school	A great extent	A moderate extent
	Instruction	
8. Issue focus	Multiple issues	A single issue
9. Instructional posture of teacher	Direct instruction followed by a role as facilitator of investigation and action	Initially traditional; as a facilitator during the group investigation
10. Demand for teacher flexibility	High	Moderate
11. Time needed	Typically 18 weeks	Usually much less than 18 weeks
12. Need for in-service education of teachers	Very high	High
13. Potential for infusion into existing programs	Low to moderate	Very high

when current reports on environmental quality are considered, we must admit that we have not been successful, on a widespread basis, in convincing world citizens to act in environmentally responsible ways.

Concern No. 2: There Are Too Few Sound National Strategies for EE

In numerous countries (including the authors' own), EE is a step-child of education, or it receives only sporadic attention. Relatively few nations have made a commitment to EE programs that involve students throughout their schooling and that utilize a carefully constructed, research-based scope and sequence. Where EE exists, students typically receive incidental exposure to environmental issues, with the emphasis on the ecological foundations and/or awareness levels. *Thus, there appear to be few concerned, nationally focused efforts that prepare future citizens to make environmentally sound decisions or to participate responsibly in environmental maintenance and remediation. As a result, only a fraction of our young learners are being exposed to logically developed, well-articulated EE programs.*

Further, there are relatively few efforts to try to change environmental behavior through the media. Certainly, there are nations that can point to television programming that focuses attention on environmental issues, wildlife, or natural ecological systems. In almost all instances, however, these media presentations deliver information about the environment and about environmental issues. Few media events focus on skills associated with individual citizens' ownership and empowerment. Similarly, with few exceptions, the number of people watching these programs is relatively small compared with the population as a whole. Further, when print sources are focused on environmental issues, those issues are frequently ones that appear newsworthy to editors, and coverage is almost totally at an issue awareness level. Without opportunities for ownership or empowerment, it appears unlikely that these efforts will move the public to widespread participation in environmental responsibility. *Thus EE media efforts tend to focus on the awareness level (which tends to be ineffective in changing behavior) and often fail to reach a large audience of learners.*

Concern No. 3: Educators Are Focused on the Wrong Strategies

A similar situation exists in the instructional materials utilized in formal educational settings. By and large, these materials are designed to provide information: information about ecology . . . information about the environment . . . information about environmental issues. Too few EE programs incorporate serious attempts to develop ownership and empowerment in learners. Again, these educational efforts typically focus only on the awareness level. Environmental educators overwhelmingly agree that the major aim of EE is to produce individuals who will willingly and responsibly participate in environmental maintenance and remediation. *Unfortunately, the majority of instructional materials in EE fail to develop skills associated with investigating and evaluating issues or with responsible citizen participation.*

In addition, most success stories are issue-specific in nature. In other words, most successes revolve around educational efforts designed to help resolve specific issues. The knowledge and skills learned are focused on a particular issue, e.g., endangered species, solid waste management, safe water supplies, forest conservation, etc. We cannot argue the importance of attending to these issues where they are locally important. However, in many instances, this strategy is seriously flawed. The flaw in this one-issue strategy centers on "generalizability." It is relatively easy to get learners focused on an issue, particularly if it is one of interest or importance to them. In many instances, educators can also engage learners in citizenship action strategies related to that issue. Unfortunately, with a single-issue focus, there exists very little opportunity to generalize the knowledge and skills to other issues (unless they are closely related to the first one). *Thus the results of our efforts are learners who may act in an environmentally positive manner with relation to one issue (or set of issues), but who do not have the knowledge, skills, and willingness to assume environmental responsibility in their day-to-day lives.*

In Closing

One of the serious impediments to the kind of instruction recommended in this document is the fact that it differs substantially from typical educational practice. As stated before, most educators firmly believe that, if we teach learners about something, behavior can be modified. In some cases, perhaps, this is true. However, in educating for generalizable responsible environmental behavior, the evidence is to the contrary. Typically, *issue awareness does not lead to behavior in the environmental dimension*. This means that we must look to a new model of instruction if behavior is important. And, because all environmental behavior is somehow issue related, it appears as though *issues must be the focus of instruction* beyond environmental sensitivity, ecological foundations, and issue awareness.

If environmental issues are to become an integral part of instruction designed to change behavior, instruction must go beyond an "awareness" or "knowledge" of issues. Students must be given the opportunity to develop the sense of "ownership" and "empowerment" so that they are fully invested in an environmental sense and prompted to become responsible, active citizens.

The research is very clear on the matter. Citizenship behavior can be developed through environmental education. The strategies are known. The tools are available. The challenge lies in a willingness to do things differently than we have in the past.

ACKNOWLEDGMENTS

The writers are indebted to many human beings around the world who have worked very diligently to make environmental education a meaningful experience for learners. We most certainly stand on the shoulders of giants and acknowledge their contributions (both instructionally and in a research context) to this paper. Only a few of these have been cited in order to make this document as readable as possible. In the development of this paper, one person stands out above all others. Dr. Thomas Marcinkowski of Maryville College in St. Louis, Missouri, has been an enormous help to the writers and has assisted with the formulation of ideas and with the behavior model seen earlier. He should also be given credit for the bulk of the citations that appear in Appendix C of this paper.

NOTES

1. The writers believe that the terms "problems" and "issues" should be used differently. Although some writers use these terms synonymously, distinguishing between them helps learners to conceptualize them differently. An environmental "problem" exists when something is at risk, for example, an animal becomes endangered. An environmental "issue" exists when human beings have differing beliefs and values concerning what should be done about the problem, for example, people may differ in their beliefs about what should be done to manage the endangered animal. This situation exists in very real dimensions throughout the world. A specific example would lie with the

African elephant. Its endangerment is an environmental "problem." How to manage the elephant has become an "issue."

2. The model presented in this paper "reflects variables associated with the prediction of, modification of, and explanation for the relative frequency with which citizens engage in this broad [range] of behaviors. . . . an emphasis has been placed on variables which may be attended to in educational programs (i.e., programs designed to modify the frequency of such behavior)" (Marcinkowski 1990).

3. In the research conducted by Sia et al. (1985/86), sensitivity predicted nearly 13% of the variance in his overall sample. It predicted over 45% of the variance in his nonenvironmental group, a sample of 66 elders in an Elderhostel Program in southern Illinois. And, it predicted nearly 10% of the variance in his sample of environmental organization members. It was also a major predictor variable in the research conducted by Sivek (1989) for at least one of his environmentally allied groups in Wisconsin.

4. Marcinkowski (1989) found that these variables were significant predictors of behavior. Sia (1985/86) measured only pollution and technology and did not find them as salient as did Marcinkowski.

5. Using curricula that involve students in investigating and evaluating issues, Holt (1988), Klingler (1980), Ramsey (1989), Ramsey et al. (1981), Simpson (1989) and others have demonstrated that middle-school students definitely participated in more positive environmental behaviors subsequent to that instruction. Ramsey et al. (1981) also confirmed this observation by surveying the parents of the students.

6. In Sia's research (Sia et al. 1985), perceived skill in using environmental action strategies accounted for nearly 35% of the variance for predicting environmental behavior when all of his samples were considered together.

7. Koslowsky et al. (1988) studied the impact of intention and investment on behavior (although their research was not conducted with respect to environmental issues). They found that "maximum prediction is attained by using only two variables, intention and investment, and their interaction." The research conducted by Hines et al. (1986/87) looked at "intention to act" as a contributing variable to environmental behavior. They suggested that "intention to act" appears to be "an artifact of a number of other variables acting in combination (e.g., cognitive knowledge, cognitive skills, and personality factors)."

8. There is no lack of criticism and comment in the literature about the lack of direction in environmental education. In 1975, Vande Visse and Stapp warned that ". . . without a clear statement of goals, an environmental education program would become a series of unrelated experiences, focusing on limited program objectives." Roth, in 1976, confirmed this prediction by stating that "the presence of environmental education in public school curricula [U.S.A.] can often be characterized by loose organization and little sense of direction." In 1977, Harvey set about to analyze instructional models in the field and found that there was little agreement about what constituted a model for environmental education.

In 1978, Childress reported on a major research study into environmental education programs in the U.S. (surveying 301 EE programs and projects) and found that less than 40% of those surveyed considered the following objectives to be primary objectives: synthesizing various alternative solutions to environmental problems into a comprehensive plan; analyzing the role of contributing factors (technology, legislation, etc.) to the causes of environmental problems; evaluating how varying value systems modify and shape the environment; and developing proficiency in environmental data collecting techniques.

Childress concluded from his study that objectives focused on helping students become knowledgeable about their environment and its associated problems, and developing an appreciation of environmental resources, were considered of more importance in a majority of programs than objectives focused on helping students actually solve environmental problems and develop problem-solving skills.

9. Several important research studies, not discussed here, have dealt with needs in environmental education relative to goals for EE. These provide substantial insight into the perspectives of teachers and EE professionals regarding the status of EE, both nationally and internationally, and specific needs for changes in curriculum, instruction, and teacher education. These would include Champeau et al. (1980); Peyton (1977); Stevenson (1986); UNESCO (1978); Volk et al. (1984) and Wilson (1988).

10. Using the Tbilisi objectives as a framework and Harvey's (1977) "Superordinate Goal for Environmental Education," Hungerford et al. (1978/1980) developed a set of goals and subgoals that appeared to be philosophically and hierarchically valid. An original set of goals was presented to a working group of the 1978 National Conference on Environmental Education [U.S.A.]. A revised set of validated goals was then published in 1980.

11. Among these studies are the Asche and Shore (1975) research on conservation behavior conducted in Canada and the Ramsey studies with seventh- and eighth-grade students (Ramsey et al., 1981; Ramsey 1989) conducted in the U.S.

12. With respect to the two instructional models recommended here, the issue investigation and action model and the extended case study model, examples of these are commercially available and can be obtained from Stipes Publishing Company, 10 Chester Street, Champaign, Illinois (USA) 61820. The Issue Investigation and Action Model is entitled *Investigating and Evaluating Environmental Issues and Actions* (Hungerford et al. 1988). The Extended Case Study Model is entitled *A Science-Technology-Society Case Study: Municipal Solid Waste* (Ramsey et al. 1989).

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APPENDIX A: GOALS FOR ENVIRONMENTAL EDUCATION

The Superordinate Goal: . . . to aid citizens in becoming environmen tally knowledgeable and, above all, skilled and dedicated citizens wh are willing to work, individually and collectively, toward achievin and/or maintaining a dynamic equilibrium between quality of life an quality of the environment.

Goal Level I. The Ecological Foundations Level

This level seeks to provide learners with sufficient ecological knowledge to permit him/her to eventually make ecologically sound decision with respect to environmental issues. The Ecological Foundations Leve would minimally include the following conceptual components:

- A. Individuals and populations
- B. Interactions and interdependence
- C. Environmental influences and limiting factors
- D. Energy flow and nutrient cycling
- E. Community and ecosystem concepts
- F. Homeostasis
- G. Succession
- H. Humans as members of ecosystems
- I. The ecological implications of human activities and communities

Goal Level II. The Conceptual Awareness Level—Issues and Values

This level seeks to guide the development of a conceptual awareness of how individual and collective actions may influence the relationship between quality of life and the quality of the environment and, also, how these actions result in environmental issues which must be resolved through investigation, evaluation, values clarification, decision making, and finally, citizenship action. Goals at this level are formulated to provide opportunities for receivers to conceptualize:

- A. How human cultural activities (e.g., religious, economic, political, social, etc.) influence the environment from an ecological perspective
- B. How individual behaviors impact on the environment from an ecological perspective
- C. A wide variety of environmental issues and the ecological and cultural implications of these issues
- D. The alternative solutions available for solving environmental issues and the ecological and cultural implications of these solutions
- E. The need for environmental issue investigation and evaluation as a prerequisite to sound decision making
- F. The roles played by differing human values in issues and the need for personal values clarification as an integral part of environmental decision making
- G. The need for responsible citizenship action in resolving environmental issues

Goal Level III. The Investigation and Evaluation Level

This level provides for the development of the knowledge and skills necessary to permit learners to investigate environmental issues and evaluate alternative solutions for solving these issues. Similarly, values are clarified with respect to these issues and alternative solutions. Goals at this level are presented in two components.

Component A: Goals for Component A are to develop in learners:

- A. Knowledge and skills needed to identify and investigate issues and to synthesize the gathered information
- B. Ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications
- C. Ability to identify alternative solutions for specific issues and the value perspectives associated with these solutions
- D. Ability to evaluate alternative solutions and associated value perspectives for specific issues with respect to their cultural and ecological implications

E. Ability to identify and clarify their own value positions related to specific issues and their associated solutions
F. Ability to evaluate, clarify, and change their own values positions in light of new information

Component B: Goals for Component B are to provide learners with opportunities to:

G. Participate in environmental issue investigation and evaluation
H. Participate in the valuing process in a manner as to permit the learner to evaluate the extent to which his/her values are consistent with the superordinate goal for environmental education

Goal Level IV. Action Skills Level—Training and Application

This level seeks to guide the development of those skills necessary for receivers to take positive environmental action for the purpose of achieving and/or maintaining a dynamic equilibrium between quality of life and the quality of the environment. Goals at this level are presented in two components.

Component A: The goal for Component A is to develop in learners:

A. Skills which will permit them to effectively work toward ends which are consistent with their values and take either individual or group action when appropriate

Component B: The goals for Component B are to provide learners with opportunity to:

B. Make decisions concerning action strategies to be used with respect to particular environment issues
C. Apply action skills to specific issues, i.e., to take citizen action on one or more issues
D. Evaluate the actions taken with respect to their influence on achieving and/or maintaining a dynamic equilibrium between the quality of life and the quality of the environment.

APPENDIX B: Citizenship (Action) Vignettes

Central Illinois. (U.S.). After surveying local residents regarding their attitudes toward the recycling of aluminum beverage containers, an eighth-grade student in a medium-sized town in central Illinois visited the mayor and shared the results of her issue investigation and survey. The mayor was so impressed with her findings that he invited her to address the city council. As a result of her survey and work with the city council, the town now has two recycling centers.

Cameroon. In Cameroon, an agricultural extension officer visits a village and teaches the farmers how to cultivate their land on the contour in order to keep soil from washing away. Instead of cultivating crops uphill and downhill as they had done before, they now work the land so as to save valuable top soil.

Midwestern United States. In a rural Midwestern community in the U.S., several junior high students became interested in a local land-use issue. The debate centered on the use of a section of state-owned land adjacent to a local river. After conducting a county-wide survey, these students used their findings to develop a master plan for the use and development of that public land, and submitted and defended the plan at a public hearing sponsored by the state Department of Conservation. Among the farmers, businessmen, bird watchers, recreationists, and others who spoke at the hearing, these students were the only participants who presented a proposal founded on data-based decision making. The master plan, which was ultimately adopted, was very similar to their proposal.

Canada. In an activity-centered program, a Canadian conservation camp director teaches middle school students appropriate conservation behaviors relating to soil, water, forests, and wildlife. Subsequent observations of this group in the out-of-doors indicates that they now practice those behaviors when not under adult supervision. Observations made of a control group indicate dramatic differences between the two groups.

Kentucky, United States. A middle school student in rural western Kentucky (U.S.) became interested in water treatment in her community. After obtaining a water testing-kit from her local water utility, she tested her household water supply as well as the supply at the local school. Alarmed at the abnormally high chlorine content, she contacted community officials, who re-tested the water and confirmed her findings. She was commended by community officials for her discovery and assured that prolonged exposure to those high rates might have indeed had negative effects on the health of the students.

Australia. In Australia, students become concerned over the possible loss of a stream and floodplain near Melbourne. They decided, with the help of their teacher, to thoroughly investigate this issue. They studied the area's biology, hydrology, and geology. They investigated the development plans and the attitudes of local residents and authorities toward preservation and development. Using this information, they then worked out an action plan that focused on the area's biological and educational values. They then advocated this plan in numerous ways throughout the community. The local council accepted this plan and the area was saved from development.

United States. Two eighth-grade students in the U.S. decided to see if bottle bills (legislation supporting a deposit on beverage containers) really are workable solutions to roadside littering and to the use of a limited resource. They wrote to officials in each of the states that have such legislation and collected information on effectiveness, administrative costs, and on the perceived positive and negative effects of the legislation.

Garnering the support of their colleagues and then of citizens in three other area communities, these two students developed a "Bottle Bill Coalition" to lobby lawmakers. The two students, who had spearheaded the coalition, convinced their friends to collect aluminum cans, clean them, crush them, and package them in one-pound bundles to mail to all the committee members. Each aluminum bundle was accompanied by a petition supporting the proposed legislation. Although their state still does not have a bottle bill, that legislative session witnessed the passage of a bill which banned the removable tab . . . considered harmful to humans and animals.

Missouri, United States. Two secondary students in a large urban area in Missouri (U.S.) noticed the increasing deterioration of their neighborhood. Upon investigating, these students discovered that a large corporation, after failing at an earlier attempt to re-zone the neighborhood for business development, had been quietly buying up residences and allowing them to deteriorate. The students interviewed neighborhood residents, documented the actions of the corporation, and presented their findings to the city council.

New England, United States. A 12-year-old student in New England (U.S.) discovered that a much-loved, 17-acre, bog-like forest was being considered as a site for a multi-million-dollar condominium development. He decided that this development simply couldn't take place. Not only did he really care for this land and for the many living things there, he felt that the area was too wet for development.

This student investigated the status of this acreage and, when he had his facts straight, he began a letter campaign to his legislators and the local TV station. He also circulated a petition against the development, which was well received in the community. Hesitantly but resolutely, he gathered support and began attending town meetings with his supporters. He successfully challenged the development. Interestingly, he received an award from his school for community service and another from the U.S. Environmental Protection Agency. Even the United Nations Environmental Programme selected him for an award.

East Coast, United States. A 15-year-old student on the east coast of the United States became concerned about the use of polystyrene trays in the school's cafeteria. Polystyrene is a plastic foam, often used for food containers, which does not decompose. Along with other plastic, it takes up space in landfills, which is always limited. Each foam tray, however, costs a nickle less than a similar pressed paper tray.

This student thought that her schoolmates would be willing to pay the extra nickle in order to help the environment. Her classmates agreed. They conducted a survey of all students in the middle school and the high school and found them willing to pay the extra nickle. Then, they set about to persuade the school board. The school board asked the students to demonstrate that willingness. The students would have a week in which they could purchase their lunches on either paper or plastic trays. During that week, nearly three-fourths of the high school students and an even greater fraction of the middle school students paid the extra money.

As a result, an all-paper-tray policy was put into effect in all of the district's schools. Following the students' lead, the township council also suggested substituting paper for polystyrene in municipal buildings.

APPENDIX C: ADDITIONAL LITERATURE OF RELEVANCE

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VIEWPOINT

Environmental Education: What Went Wrong? What Can Be Done?

LARRY M. GIGLIOTTI

The title of this article suggests that environmental education has been a failure. However, such an assessment can be made only in response to a commonly accepted definition of environmental education:

> Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution (Stapp et al. 1969).

Depending on which outcomes and the type of evaluation you consider, environmental education can be evaluated in both positive and negative ways. There are many outcomes considered to be succesful products of environmental education, the most important and visible of these being the broad-based support for the environmental movement. According to William K. Reilly, administrator to the U.S. Environmental Protection Agency, "The public . . . has come to an unprecedented awareness of the threats to our environment" (Reilly 1990). Almost everyone claims to be an environmentalist—just ask any candidate for office.

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What I am proposing is that environmental education has produced ecologically concerned citizens who, armed with ecological myths, are willing to fight against environmental misdeeds of others but lack the knowledge and conviction of their own role in the environmental problems. It is likely that most people would be unwilling to make great personal sacrifices for the sake of the environment; that is, the necessary changes in values have not really occurred. Instead, people have selectively screened the environmental education messages and constructed belief structures to support their own value systems rather than alter their lifestyles to any great degree.

On the plus side, the environmental movement has had a significant role in the reduction of many pollutants. For example, DDT and other pesticides are highly regulated today. Most industries are concerned about their image and are therefor usually careful to dispose of wast in a safe and legal manner. The potential for hefty fines as well as public outcry against environmenta misdeeds could spell disaster for a industry. Similarly, the mountin public pressure to recycle may b considered another successful outcome of the environmental movement.

Although environmental education has been successful at producing an environmentally concerne citizenry, there have been some undesirable outcomes as well. We see to have produced a citizenry that i emotionally charged but woefull lacking in basic ecological knowledge. Arcury and Johnson (1987, 36 reported that "public environmental knowledge remains at an alarmingly low level even though the environmental movement has been highly publicized for over two decades." An educator might interject her that the hard part is done and tha all we need do now is add knowledge, either through traditiona methods or through new and innovative ones. Iozzi's (1989) review o the literature suggested that the "affective domain" is the key entr point for environmental educa-

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tion—that one must first obtain positive environmental attitudes before dealing with the cognitive domain. Unfortunately, a closer examination of the problem and of human nature revealed that the solution may not be that simple. Iozzi finally suggested a more holistic approach of dealing simultaneously with both the cognitive and the affective domains.

Our citizenry does not completely lack information. Instead, it is attitudes, which are based on a number of interrelated beliefs and values, that are the problem. These beliefs are often either not ecologically sound or are not based on comprehensive knowledge, such as information on the alternatives and consequences of actions, and information on possible individual action.

Therefore, simply providing more information may not alter attitudes. The task of changing one's belief structure is more difficult than simply adding knowledge; this is especially so in the United States because the current belief structure supports the value system (Langenau and Peyton 1982). Of particular importance is the finding that the current value system of most people is not really that much different from what it was before the environmental movement began. Thompson and Gasteiger (1985) reported that between 1971 and 1981, changes in environmental attitudes of students at Cornell University were in the "direction of a more materialistic lifestyle with less consideration for environmental/energy issues and concerns." It seems pertinent to look at this population in 1991 to see if this trend has continued or if the pendulum is now swinging in the other direction.

Somehow, environmental education efforts seem to have trained people to believe that while nature is good, all human impacts on the environment are bad. This internal conflict (note that now the individual must reconcile his or her position in relation to the environment) has no doubt contributed greatly to the support of, and commitment toward, the environmental movement. People can now label themselves as "good" environmentalists who are committed to fighting against those who harm the environment, and by denying their own personal role in the problem, they can escape the "good-bad" conflict. Indeed, everyone seems willing to speak out and demonstrate against other people, especially industry. There is very little individual sacrifice needed when you blame someone else for the problem.

The underlying belief-value structure that most needs changing is the myth that people are separate from the environment—that we are somehow different from all other living things.

The underlying belief-value structure that most needs changing is the myth that people are separate from the environment—that we are somehow different from all other living things. People must discard this myth and realize that the environment places the same limitations on people as it does on other living things. From this must flow the realization that each individual is responsible for the current levels of pollution and resource depletion. Environmental education messages must make this connection and also provide information detailing what individual actions people can take to alleviate environmental problems. To have credibility, these messages must also show logical connections between individual actions and solutions to environmental problems.

Environmental Education and Minorities

Another way to evaluate the success of environmental education is by examining the level of minority support for the environmental movement. The environmental movement is primarily a white, middle-class cause (Kellert and Berry 1981; Humphrey and Buttel 1982). In a small study of black university students, Kreger (1973) reported that black respondents felt that blacks are not as interested in ecology as whites are. Dolin (1988) summarized two studies that found that blacks' interest in, and knowledge about, wildlife was much more limited than that of whites. However, Caron (1989) concluded that blacks are just as concerned as whites about certain types of environmental issues, such as toxic wastes and other health threats from pollution. Considering that minorities are a fast-growing, significant proportion of the population, it is important that minority concerns be addressed and education messages be prepared with these audiences in mind. For example, environmental education that focused on far-off problems seemingly unrelated to local issues would probably be a "turn-off" for them.

In Kreger's (1973) study, a number of blacks reported that their lack of interest in, and concern with, ecological problems was related to their low economic status, implying that their level of environmental concern would not increase until they have the capabilities and resources to enjoy more of the benefits of society.

Environmental Education and Special Interest Groups

Another negative outcome is that environmental education and the environmental movement seem to have produced a citizenry that is especially difficult to work with on resource management problems. For example, we have ecologically concerned citizens who will demonstrate against environmentally sound dump sites but who at the same time will continue to be opposed to increased disposal fees. Others will demonstrate against pollution but will remain opposed to pollution devices placed on cars. Still others will demonstrate against commercial use of wildlife, claiming it is morally wrong to profit from nature. Yet, mankind's existence (and that of all other living creatures) depends on the ability to exploit the environment. As living organisms, people instinctively breathe, eat, drink, and reproduce. We are no different from other animals (and plants) who must also "exploit" the environment.

Consider the statement by Cleveland Amory, founder and president of Fund for Animals, that hunting has no place in a civilized society (Satchell and Schrof 1990). The Fund for Animals, which is leading the fight against legal hunting, bases its opposition on the premise that man is separate from, and harmful to, the environment. It is a fact of life, however, that many animals eat other animals; man is no different. Yet, the "animal rights" movement has directed significant amounts of money and time into an effort that has done nothing for wildlife populations. Regulated hunting (*as practiced today*) removes only a part of the annual surplus of wildlife. Eliminating hunting would eliminate a source of food for man that would have to be replaced by increasing farm output, leading to a further reduction in wildlife habitat.

Another result of the myth that people are separate from, and harmful to, the environment has been the vast and growing support for refuges or other areas set aside for protection. Designating protected areas only furthers the myth. It also reduces personal responsibility by lulling people into the belief that because areas have been set aside to be free of man's influence, we can feel good that we have saved at least part of the environment. At the same time, however, we can continue harmful activities—business as usual. Scientists, though, now know that no area is free from the effects of pollution; pesticides have even been measured in Antarctica.

What Can Be Done?

Education has been viewed as the salvation of pending environmental problems—if we could produce environmentally literate citizens, maybe we could begin to solve the environmental problems in time. But if, after 20 years of effort, we have not accomplished this goal, then we need to consider new and drastic measures. The first thing we must keep in mind is that no single answer will likely be the sole solution—the task is too complex. We will need to constantly evaluate proposed solutions and make corrections where needed.

First we need to spend more time and research on problem definition. Too often we waste effort researching misdiagnosed problems. We rush in and look for solutions before we fully understand the problems; that approach often leads to a concentration on dealing with symptoms rather than the real problems. When we have an accurate definition of the problems, the decisions that follow are often clearer (although not necessarily easier) and solutions tend to be more long term. A case in point is this article, which is just one person's assessment of environmental education based on a cursory examination of some of the evidence. This article should not be taken as a complete definition of the problem; rather, what should follow is research to further clarify the problem. For example, I hypothesized that environmental education has made little progress in producing a citizenry willing to make personal sacrifices. Few researchers have measured environmental concern in this form.

However, an emphasis on problem definition should not lead to inaction. Depending on the urgency of the problem, it may be necessary to implement potential solutions before all the facts are known. The key in such situations will be to remain flexible enough to be able to change when evidence suggests new directions are needed.

Yambert and Donow (1986) proposed that since environmental problems are too complex for people to understand, we should teach a basic code of ethics that, if followed, would solve the problems. This approach is like teaching science (environmental education) as a religion. First, a religion can be as easily rejected as accepted. Similarly, it can be accepted by one generation and rejected by the next. More likely, only a segment of the population would accept it at any given time. Why would people in the United States give up their high rate of consumption (their luxuries) to follow an environmental code of ethics if they did not understand the basic underlying ecological reasons? Second, people want and are taking more control over their lives and will not likely give up this independence to be ruled by an environmental ethics code. Independence and freedom are not to be given up lightly, and I think that it will become easier for people to make lifestyle changes only when they understand the reasons.

Environmental educators need to supply information of a very practical nature, addressing the role of the individual in environmental problems and what alternatives and/or actions are necessary to solve such problems. Most important, educators must be sure their messages are ecologically sound and that they do not perpetuate environmentally irresponsible myths.

To evaluate new environmental issues and understand ways to solve these problems, every citizen needs to understand basic ecological principles. Education researchers have been saying this for years (Hungerford et al. 1980). However, instead of worrying about whether environmental education is infused equally across curriculum materials as suggested by Simmons (1989), *we need to make environmental education the focal point of the entire educational process*. Environmental education should not only share equal status with reading, writing, and arithmetic; it should also be an integral part of all courses. Along with this shift in emphasis we need to instill a goal into every single student: To work toward the development of a stable population of people living harmoniously in a quality environment.

Why is such a dramatic change needed? Why can't we continue on as before? The answer can be explained in ecological terms. Certain activities and behaviors that can be sustained can be injurious at a higher population level. In other words, people must change because the circumstances in which we now live have changed. As Malone and Corell have (1989) said of the future:

> The capacity of the global life-support system to sustain a technologically advanced and exponentially expanding civilization is likely to collapse within the foreseeable future. (p. 7)

If we plan for change, the changes will be less difficult. If we wait for the changes to hit us head on, fighting each crisis as it arises, the social and environmental upheavals could make life very miserable.

Planning for change through education means that the K-12 education system will need to be restructured. Changes are also needed at the college level, where we are educating individuals who will be doing research and guiding future policy and, thus, will have a larger impact on the future. Also, we cannot continue to produce environmentally illiterate teachers. Hooper (1988) reported that there were a number of common misconceptions about wildlife management among California grade school teachers. There are probably misconceptions among teachers about other natural resources, and certainly about the alternatives available to resolve resource management issues.

There has been a long-standing philosophical debate about whether higher education should produce generalists or specialists. Yambert and Donow (1986) stated that "fields of knowledge have grown so complex that no one can master more than a few of them." However, environmental policy cuts across many fields and requires generalists who understand the language and basic concepts of those fields. Schenker (1972) pointed out the importance of both generalists and specialists, and said it is vital that both types work together. I would agree with Schenker.

Conclusion

Environmental education has not produced a citizenry that is able and willing to solve today's environmental problems. Although we have an environmentally aware population, people still lack the necessary knowledge about the roots of the problems and specifically what actions they can and should take. It may be a very difficult task to get people to accept the need for personal lifestyle changes that may be necessary to solve some environmental problems.

Environmental education needs to break down the environmental myths of today and start showing the individual connections to today's environmental problems. At the same time, education should help individuals learn what they can and should do to improve the environment and create a desire in each person to take the correct actions, including those that require individual sacrifice. For this to happen, people must first believe that solutions to environmental problems are necessary. They must also fully understand the consequences to the environment and to themselves of not taking action to correct these problems. To get this message across, environmental education must become a focal point of the entire educational system, from elementary through higher education.

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Multicultural and Urban Environmental Education

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URBAN AND CULTURALLY DIVERSE AUDIENCES are typically overlooked in popular, traditional EE programs. Today, however, with our growing urban populations and increasingly diverse culture, educators are working to develop more suitable, innovative, and collaborative programs for these audiences. This section provides teachers with insight into the kinds of obstacles and opportunities presented by multicultural and urban EE.

The first two articles in this section give a broad overview of multicultural education and its current status in the educational system. These are followed by two articles that explain the significance of combining EE and multicultural education. The next readings place urban education in a new and refreshing perspective, and the last articles describe ways that EE can happen in urban environments.

Brandt, Ron. "On Educating for Diversity: A Conversation with James A. Banks," *Educational Leadership* 51:8, May 1994, pp. 28–31.

James A. Banks, director of the Center for Multicultural Education at the University of Washington, is a central figure in the area of multicultural education. In his vision for multicultural education there are some key connections to EE. He advocates including various cultures in educational curricula so teachers can look at environmental studies from all cultural perspectives. By looking at reality from a global perspective, Banks hopes to transform children's view of reality. Banks concludes this interview by expressing that transformation of the current system does not mean the sacrifice of American democratic values.

Garcia, Jesus and Sharon L. Pugh. "Multicultural Education in Teacher Preparation Programs: A Political or an Educational Concept?" *Phi Delta Kappan* 74:3, November 1992, pp. 214–219.

Garcia and Pugh argue that multiculturalism in teacher education is currently "too political" to be effective. They explain the development of multiculturalism, define multicultural education, and suggest a plausible method for infusing a meaningful multicultural view into teacher education. They conclude that multicultural education involves everyone and needs to be removed from its current political context. When educators lack knowledge and confidence about multicultural education, they feel disconnected and unable to communicate its importance.

Salter-Stith, Cynthia, Julia Washburn, and Dorothy Barton. "A Circle of Sharing: Making Your Environmental Education Programs Multicultural," in *Proceedings of the 1993 National Interpreters Workshop*. Washington, D.C.: National Park Service, 1994.

The article unites multicultural and environmental education. Both types of education draw upon each other for new solutions to environmental problems. When dealing with a variety of cultural backgrounds, teachers need to use cultural resources to understand different "environmental points of view."

Hidalgo, Nitza M. "Multicultural Teacher Introspection," Chapter 6 in *Freedom's Plow: Teaching in the Multicultural Classroom*, edited by Theresa Perry and James W. Fraser, New York, NY, Routledge, 1993.

When educators understand their own cultural perspective and biases, they are better able to communicate with and teach *multicultural audiences. Hidalgo explains how the dominant Anglo-European educational framework devalues any other cultural perspectives. She emphasizes that if teachers are able to understand themselves, they will better understand and appreciate their students' culture.*

Williams, Belinda and Ellen Newcombe. "Building on the Strengths of Urban Learners," *Educational Leadership*, May 1994, pp. 75–78.
Williams and Newcombe thoughtfully present a framework for urban educators who deal with "emotionally disturbed or disruptive students." The framework focuses on reconceptualizing certain views about these students—"deprived" becomes "culturally different," "at risk" may be just one side of "resilient." They describe a student who successfully operated his own drug operation for five years and point out that he demonstrated intelligence and potential. This article is especially relevant for urban EE, because it gives educators a new perspective for approaching certain students.

Cohen, David L. "Valuing Human Habitats," *Environmental Education Advisory Council Newsletter*, Spring 1994, pp. 1 and 5.
Cohen briefly explains why environmental educators should re-evaluate their negative perceptions of the urban environment. He describes seeing a slide show at a conference that showed only unpleasant pictures of the urban environment in order to emphasize contrast with the beauty of a natural environment. Cohen calls for increased value of the urban environment—when educators recognize the importance of urbanized areas, they will be better able to communicate the significance of protecting the natural environment.

Weilbacher, Mike. "Talbert Spence on Urban EE: Seeing Rich Lessons Within Big Cities," *Natural Science for Youth Foundation Newsletter*, 1988, pp. 5–8.

In this interview, New York City environmental educator Talbert Spence talks about the importance of teaching urban children about their surroundings and how that relates to the more natural and less built environment. Student participation in the lesson is essential for learning; teachers who are afraid of topics they do not fully understand can still bring EE into the classroom by challenging students to investigate these topics themselves.

Breitbart, Myrna Margulies. "Urban Environmental Education: A Subversive Form of Community Study?" *Massachusetts Review* 25:1, Spring 1984, pp. 658–667.

Breitbart gives several examples of how children can learn to appreciate life in the urban environment. This article focuses on new ways urban children can think critically about and evaluate their communities. For example, one group of students walked urban trails and took photographs, which they later discussed and analyzed; the author describes how this type of activity can stimulate children of different cultures to actively learn about their surroundings.

Reprinted with permission of Association for Supervision and Curriculum Development, Due for Publication in August 1994, Brandt, Ron. "On Educating for Diversity: A Conversation with James A. Banks," Educational Leadership 51:8, May 1994.

On Educating for Diversity: A Conversation with James A. Banks

Ron Brandt

James A. Banks explains how to "transform the mainstream" so that all students function better in their home communities as well as in the larger world.

James A. Banks

[illegible]

You often speak and write about three orientations to multicultural education: the contributions, additive, and transformative approaches. You obviously think the transformative approach is better, but the other two are far more common, aren't they?

They are—and that may be all right. Many of the school systems I work with that are at the additive and contributions stages see their current efforts as prerequisite to moving farther. They start with contributions—you know, Black Day, Indian Morning, and Jewish Afternoon. I used to be critical of that, but I've come to see that you've got to start somewhere. I was criticizing the contributions approach one day when a teacher said to me, "I just wish we *had* days that recognized contributions. I'd be proud if we could just do Martin Luther King Day."

So I'm more sympathetic to the contributions approach now. I think it's OK to start with Black History Month, as long as you don't stop there. And I think it's fine to start by adding good books to the existing curriculum—let's say, *Let the Circle Be Unbroken* by Mildred Taylor (1981) to 5th grade language arts. You can't transform the curriculum overnight. It took 300 years to get the current curriculum structure—the Renaissance, the Middle Ages—and it's going to take a long time to transform the current curriculum into new patterns.

Transformed to what? What does a transformed curriculum look like?

What I mean by transformation is helping kids to look at reality differently. For example, you can put Indians into the curriculum without really changing its structure. What Indians do you add? Typically, we add Sacajawea and other "good" Indians to the curriculum. But if you really transform the curriculum—change its perspectives, change its assumptions—you might study Geronimo, who challenged the social and political structure.

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Another example I often give is "the Westward Movement." Westward to whom? It wasn't westward to the Lakota Sioux; for them, it was their homeland, the center of the universe. And, of course, it wasn't west to the Mexicans, who considered it north, or the Alaskans, for whom it was south, and so on. I think kids should talk about the many meanings of "the west"—what it meant for different people.

Now, this is not to debunk the people who went west, or to make anyone feel guilty. It's to help kids understand that when some people went west, other people were already there. To the Lakota Sioux, the settlers were not heroic pioneers but invaders. We may not see them that way, but that's how others saw them.

So the idea is to look at a topic that is an established part of the curriculum and think about it from other points of view.

Yes, to reconceptualize it.

I can see how this applies to social studies, and to the arts and humanities, but does it apply to other curriculum areas?

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You can't transform the curriculum overnight. It took 300 years to build the current curriculum structure.

Not to all, but the broader aspects of multicultural education apply to all subjects, all teaching. For example, a physics teacher may be able to do something with content transformation, but not much. What may be more appropriate for the physics teacher is "equity pedagogy." By that I mean changing teaching strategies so that girls and kids of color will learn more effectively.

A good example of equitable pedagogy is the work of Philip Treisman at Berkeley. Treisman noticed that the Chinese students were doing well in freshman calculus but that black students weren't. These were very bright kids—Berkeley gets only the best—so he decided to try to find out what they were doing differently. He found that the Chinese-American students were helping each other in tutorial study groups, so he structured groups like that for African-American students, and sure enough, they increased their academic achievement in calculus.

When we hear the term "multicultural education," many people think only of curriculum content, but you're saying it also includes such things as teaching for equity and working to reduce prejudice.

That makes sense, although for this conversation we'll probably focus mostly on curriculum. For example, Rod Janzen (See "Melting Pot or Mosaic," p. 9), says there are two ways of defining multicultural education: one emphasizing assimilation of multiple cultures into a common American curriculum, the other emphasizing pluralism, or what some call a cultural mosaic. Do you agree there are these two perspectives, and that teachers get caught in the crossfire between them?

The two perspectives certainly exist, but I don't think it's such a dichotomy. The goal is to help kids function in their home communities—their ethnic communities—and in the mainstream world; they have to do both. And we do that by transforming the mainstream—the center—so that it accepts some differences. Everybody has to make some accommodations; students should read Langston Hughes, but also Charles Dickens and Robert Frost.

As a black growing up in the South, I had to change—but I didn't have to give up all that I was. In my segregated school, we sang the National Anthem each morning and then the Negro National Anthem, "Lift Every Voice and Sing." We knew we needed both.

I've heard you say that including more material from a wider range of cultures doesn't mean we're neglecting Shakespeare and Benjamin Franklin, but there is really only so much time available to teach history and literature. If you're

going to do more of one thing, you have to do less of something else.

Not necessarily. Maybe you rethink what you're doing. For example, at a museum in Germany last summer, I saw a painting of a black Madonna, which reflects a black presence in early Europe. That made me realize that, in history, we need to know more about the African intersections with Europe. Africans influenced Western civilization in many ways. For example, Picasso's work was heavily influenced by African art.

A book by Jack Weatherford called *Indian Giver* (1988) describes how Native American contributions to Western Civilization transformed the world. Another is called *Native Roots* (1991) which describes how the Indians enriched America. Such books help us see interconnections between cultures. I don't think it's either/or.

I can see why you say that in many cases we need to transform design of the curriculum. If you're doing the traditional survey of English literature, it's going to be hard to incorporate other cultures. You're stuck with Chaucer, Keats, and Shelley, and so on.

Yes, but as Toni Morrison points out in her book, *Playing in the Dark* (1992), even the absence of blacks in some of these major works makes a statement about the black presence. Morrison argues that the identity of whites was formed to contrast to the black population. For example, whites were able to describe themselves as free because blacks were enslaved. White was defined as beautiful, and black as ugly. Morrison's point is that even the absence of blacks in white mainstream literature makes a statement about the black presence. When studying works in which the black presence is not explicit, the teacher can help students to identify ways in which blacks are implicitly present and why their presence is implicit rather than obvious.

Nowhere in my writing, or in the writing of other multicultural educators, do we advocate cultural relativism.

That suggests another controversial topic. In recent years, some educators have set out to reorganize the entire curriculum around the culture of the particular students they're teaching. The prime example of that, of course, is Afrocentric curriculum. Is there a danger in such a relatively narrow approach?

Here's my feeling on that. Given the desperate situation of black males and blacks in general in this society, I think we need some dramatic experimentation. I don't need to go over the litany of statistics; everybody knows we have a major crisis—and we don't know what to do about it. As long as innovative approaches are constitutional and as long as they don't hurt kids, we ought to give them a chance.

I visited an Afrocentric school in Detroit—the Paul Robeson School—which, by the way, had some girls enrolled—and I was deeply touched by what they are doing. They're taking young black kids who live in an inner-city community plagued by poverty, crime, drugs, and gang activity, and they're giving them security, pride, and hope. Those of us not directly involved in schools have to be supportive of people who are struggling in the trenches to make a difference.

A movement that seems closely related to multicultural education is global education, but I know you distinguish between the two. How?

They're similar in many ways, but one emphasizes cultures of other lands, while the other deals with ethnic diversity within the United States. Both are needed. They both have important goals. But confusing the two can lead to avoidance of critical concerns: we try to get teachers to teach about the internment of the Japanese Americans in World War II: they do a nice unit on Japan. We encourage them to deal with the barrio in Los Angeles, and they do a nice unit on Mexico. I've seen it happen over and over.

They are connected, though, aren't they?

Sure, you can make a connection. But that connection must be made explicit. If you want to know the difference, talk to Japanese Americans who have visited Japan. They're not Japanese; they're as much foreigners as you and I are. I'm going to Africa for the first time this coming summer, and, as Maya Angelou described the experience in her wonderful book, *All God's Children Got Traveling Shoes* (1986), I expect to be reminded of how American I really am.

I wanted to ask a question about acceptance of cultural differences. I've been reading recently about an international movement to ban so-called female circumcision, a horrible practice, which opponents describe as genital mutilation.

Defenders of the practice say it's traditional in their cultures, so critics should mind their own business. In light of what you've just said, that example may not be appropriate, because it is primarily international. Still, it is a striking illustration of the problem of differing cultural values.

I welcome the opportunity to clarify where I stand on matters like that. Our critics misinterpret multiculturalism by claiming we are cultural relativists. Nowhere in my writing, or in the writing of other multicultural educators, do we advocate cultural relativism. Rather, we make a strong, unequivocal commitment to democracy, to basic American values of justice and equality. And that means that values that contradict justice and equality are not acceptable.

But educators do sometimes imply cultural relativism in the language they use. With the best of intentions, educators declare their intent to teach "respect for and acceptance of other cultures."

Yes, goals like that are unfortunate, because they cause misunderstanding and provoke abuse from the critics. Taking such language literally would mean having respect for Nazi Germany.

But how can we say it without being misunderstood? Opponents of outcome-based education in Pennsylvania objected strongly to the word "tolerance." I've always considered tolerance a lukewarm term. Surely we can do better than simply tolerate one another—although even that mild word was objected to by some religious conservatives who said it implied, among other things, acceptance of homosexuality.

> While we value diversity and are committed to that ideal, the diversity that we value must exist within the framework of American democratic values.

Conservatives are citizens too, of course, and they have a right to express their views in a public forum. However, the right by a group to express its views within a democracy does not mean that all views should have equal power to influence the civic community. In a democratic, just society, all views cannot have equal weight. Views and opinions that violate the human rights of others, such as gay people, cannot be sanctioned or tolerated in a democracy. In a democracy, we must take a strong stand and defend equality and justice for all groups, no matter how stigmatized they are within society, because as Martin Luther King said, "Injustice anywhere is a threat to justice everywhere."

I'm intrigued and troubled by the problem of conservative objections to multicultural education. It's very complicated because religious conservatives believe there is a correct way to think and they do not want their children to be taught, for example, to condone religions other than their own.

I agree it's a difficult problem. However, schools are public institutions that should promote the common good and the overarching values of the nation-state. While we value diversity and are committed to that ideal, the diversity that we value must exist within the framework of American democratic values. Gunnar Myrdal calls this framework the American Creed in his study published in 1944, *An American Dilemma*. Myrdal points out that American values include justice, equality, and human rights. Our national values also include the right to freedom of expression and freedom of choice. Many of the religious conservatives deny these rights to others, and consequently violate some of the basic values of our democratic legacy.

Cultural freedom and democracy can exist only within the framework of an overarching consensus of values. If cultural freedom has no bounds, then the center cannot hold and national unity becomes threatened. Democratic societies are quite fragile. ■

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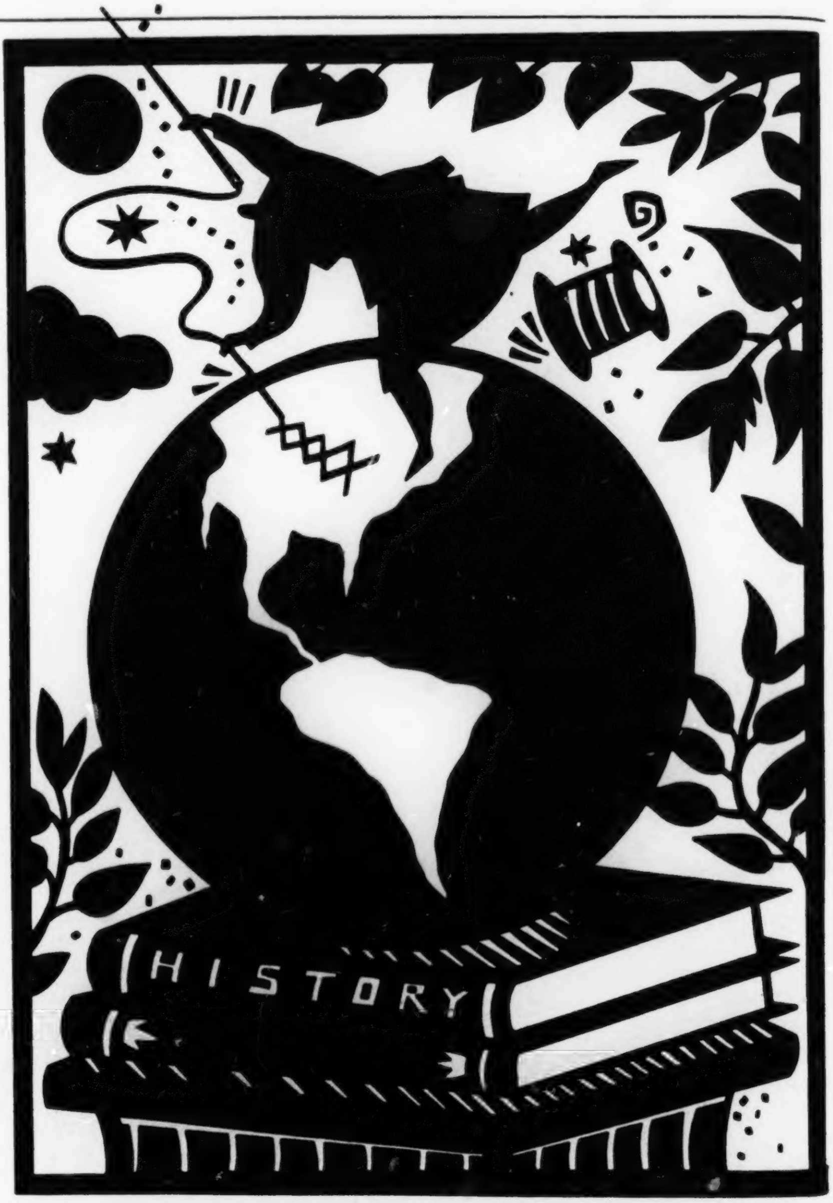
Multicultural Education in Teacher Preparation Programs

A Political or an Educational Concept?

Our schools, their programs, and their teachers should reflect the changing population patterns of our nation, Mr. Garcia and Ms. Pugh remind us. Schools of education can either exercise leadership in this effort or continue on their current course and risk obsolescence.

BY JESUS GARCIA AND
SHARON L. PUGH



WHY IS IT that, after more than a decade of rhetoric and official declarations, multicultural education remains a segregated enterprise in schools of education, with little or no impact on the curricula of preservice teachers?[1] Why the lack of commitment to and initiative on this component of teacher education? Could the problem be one of perception? Are issues that involve people of color, such as preparing preservice teachers for culturally pluralistic classrooms, of concern only to members of minority groups? Are they not worthy of the serious and sustained attention of all teacher educators?

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The quick answer to these questions is that multiculturalism will remain a distorted issue as long as it is construed as a political rather than an intellectual or educational concept.[2] To elaborate on this response, we will trace the development of the concept of multiculturalism, propose a broad definition of multicultural education, and suggest a foundation for infusing a meaningful multicultural perspective into the teacher education curriculum.

MULTICULTURALISM IN EDUCATION

Among the more common ways of viewing multiculturalism in education are the following: as an approach that incorporates into the curriculum the historical and educational experiences of a particular minority group or of all minority groups; as a way of including in the curriculum a local or regional minority perspective, usually of one major group; as a compensatory approach in which the curriculum portrays minority groups as heroic or martyred; or as a focus on international issues rather than on ethnic, racial, and other cultural groups in the United States.[3] Whatever the merits of these conceptualizations, they are at best incomplete and so are likely to be viewed as preferential, appeasing, or evasive. They overlook the real issues embedded in the original concept of multiculturalism as a form of education that is simultaneously about cultural diversity and about students from different cultural backgrounds.[4]

While predictions vary, demographers agree that the racial and ethnic proportions of the U.S. and of the world will change in the 21st century. In his introduction to the published proceedings of a conference on the national need for minority scholars, Robert Lichter, executive director of the Dreyfus Foundation, recounts often-cited statistics to emphasize the changing complexion of American society. By the year 2000, Lichter writes, whites will constitute only 55.9% of the U.S. population, down from 75.5% in 1980.[5] Internationally, similar population trends are predicted for the 21st century. Gwendolyn Baker estimates that, at the turn of the century, five billion of the six billion people on earth will be nonwhite.[6] Not surprisingly, among scholars writing in the area of minority/majority relations, the meaning of the term *minority* itself is changing and is already of little value in discussing relationships between people of color and whites.

U.S. society is becoming more and more culturally pluralistic, but such is not the case with regard to the campuses of most U.S. universities. Enrollment patterns for the Eighties reveal a decrease in the percentage of degrees awarded to African-Americans and Latinos. Moreover, faculties, if not student bodies, remain predominantly white and male. "Gains that had been evident in the Sixties and part of the Seventies," writes Lichter, "are displaying a marked and discouraging reversal, with ominous consequences for our ability as a society to survive and grow."[7] Recently, the American Council on Education has found slight increases in the numbers of minorities attending colleges and universities. However, these gains may well disappear as the current recession lengthens and minorities and other young men and women are forced to reassess their priorities. In short, the little evidence available suggests that both faculties and student bodies in schools of education will remain predominantly white for the foreseeable future. The goal that early civil rights activists had hoped for – changing the racial complexion of America's institutions of higher education – has simply not become a reality.

THE ISOLATION OF MULTICULTURAL CONCERNS

The mismatch between the composition of society and that of teacher education programs creates an atmosphere in which multiculturalism is viewed as a special and somewhat exotic phenomenon. To many nonminority faculty members, multicultural education seems to deal only with the negative societal experiences – particularly the school experiences – of minorities. Some nonminority faculty members may view multiculturalism as a means of enhancing the self-concept of minority children who are presumed to enter school with negative perceptions of themselves. Others may see it as a curricular innovation that recovers lost pages of history by highlighting the contributions that minorities and other underrepresented groups have made to the American experience.

> Demographers agree that the racial and ethnic proportions of the world will change in the 21st century.

These and similar perspectives define multicultural education as a "minority thing." This distorted view may stem from the fact that multicultural education grew out of the civil rights movement of the Fifties and Sixties. Educational leaders at the time used such phrases as "minority education" and "education for the disadvantaged" to pressure school personnel to correct practices that limited the opportunities of African-Americans and other minorities.[8] Beginning in the late Sixties and continuing through the Seventies and into the Eighties, leaders lobbied for the rights of other underserved groups. In short, the education agenda of the civil rights movement, viewed from a broad perspective, is about all those societal groups that historically have not benefited from public education, including poor children of all colors, people with handicapping conditions, and those with language differences. Indeed, even the gifted and talented, insofar as they are underserved by the education system, may be brought under this broad umbrella.

At the same time, perhaps as a result of having had little contact with minorities and others viewed as culturally different, many white faculty members have difficulty understanding and accepting the concept of cultural pluralism. A brief description of faculty members in schools of education may suggest why this is the case. Nearly 60% of faculty members in schools of education are 45 years old or older.[9] They attended high school and college in the Fifties and Sixties, the period in which college enrollments were just beginning to change in racial composition. During those years, few universities offered courses that dealt explicitly with cultural pluralism, and teacher education programs did not require multicultural education for graduation. Although they may have supported or participated in the civil rights movement, these faculty members are not likely to have felt themselves changing in a changing society. As a result, many of them view cultural pluralism solely as a recognition of minorities, not as a different way of perceiving society as a whole.

In the ensuing years, members of education faculties have learned about multicultural education from the media, from interactions with colleagues, and from the professional literature. Those who are most informed have studied these sources seriously, and some may have progressed beyond the perspective that multiculturalism is only about minorities. But the majority of white faculty members do not perceive themselves as members of any group involved in cultural pluralism, which leads them to offer the defense that they are therefore not "qualified" to teach about it.

This defense may also represent a level of sensitivity associated with matters relating to race. Do white faculty members avoid arenas in which, fairly or unfairly, they may be labeled as racist? There is no definitive answer to this question, but it is curious to listen to education professors representing all political perspectives discuss a range of issues, at both intellectual and emotional levels, yet fall silent or defer to their few minority colleagues when issues relating to race and cultural pluralism surface. However, as much as anything, the argument that white faculty members are unqualified (by virtue of their whiteness) to teach about cultural pluralism, whether it is covert or articulated, reveals a deep-seated unwillingness to deal with multiculturalism.

'POLITICAL CORRECTNESS' AS A FOIL TO MULTICULTURALISM

Perhaps the feeling of awkwardness and the fear that one may unwittingly reveal an attitude judged offensive by an individual or a group have contributed to the emergence of the term *political correctness*, which is used to protest what some call the restriction of free expression. "Only a few months ago the expression 'politically correct' was an inside joke," wrote Scott Keller in June of 1991. "Today the words blaze from the covers of magazines and newspapers, tarring colleges and universities as left-wing hotbeds where dissenting opinions are squelched."[10]

The phrase *political correctness* serves the purpose of defining a political and an intellectual perspective as an aberrant ideology and then attacking it as indoctrination. This view has been developed in a number of popular books, including Alan Bloom's *Closing of the American Mind* and Roger Kimball's *Tenured Radicals*. But no one has attacked political correctness so directly as Dinesh D'Souza in *Illiberal Education*.[11] D'Souza criticizes as violations of free speech the recent university proscriptions against language construed as belittling to a variety of groups, including races, ethnic groups, and women. Like Kimball, he argues that the "radicals" of the Sixties (the decade in which D'Souza was born in India) have taken over U.S. universities and are using them as centers from which to launch their leftist political revolution.

A similar charge influenced the decision on the part of the University of Texas to withdraw Paula Rothenburg's *Racism and Sexism: An Integrated Study* – described in *Newsweek* as a "primer of political correctness" – as the text for a controversial composition course.[12] Referring to critics such as the National Association of Scholars, a Princeton-based organization of conservative academics, Rothenburg writes, "They have so little faith in this nation's potential to realize the democratic values we have so long espoused that they mistakenly believe that identifying the racism and sexism in our past and present will weaken the nation rather than strengthen it."[13]

Ridiculing the democratic goals of a multicultural perspective with the charge of "political correctness" is a semantic subversion that undercuts the validity of pluralism as a universally shared experience. Lodged securely in its political pigeonhole, multiculturalism can be conveniently associated with minorities and their negative experiences in public education. This narrow view has contributed to the marginalization of multiculturalism, has hampered its integration into teacher education programs, and has limited faculty research initiatives.

> The mere survival of multicultural education without its healthy development might be a fate worse than death.

But finally we must confront the irony of considering multicultural education as the domain of minority faculty members, while enrollment trends in higher education today are making such faculty members an endangered species. These enrollment trends would predict either the demise of multicultural education or, if it is to survive in any form on the education agenda, the greater involvement of majority faculty members, who can no longer be comfortably excused from including their own experiences in the concept.

PRESERVICE TEACHERS IN PLURALISTIC CLASSROOMS

Survival can take many forms, however. And the mere survival of multicultural education without its healthy development might be a fate worse than death if survival in an attenuated form fosters negative attitudes toward diversity. A primary reason for pursuing the issue of multicultural education is the low value undergraduates in teacher education typically assign to multicultural education.

In discussions and assignments, students are able to provide responses that allow them to "get their multicultural tickets punched." However, their comments on course evaluation forms and in exit interviews reveal that a deeper set of entrenched attitudes has not been affected.

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Their responses range from the narrowly exclusive ("multicultural education is about minorities" and "culture, cultural diversity, and teaching/learning styles are concepts that are only appropriate when describing the educational experiences of minorities") to the pernicious ("multicultural education and what's wrong with education are synonymous terms"). Some comments simply reflect denial: "I am a white student with no ethnic identification, and multicultural education makes no sense to me." Or "I don't need multicultural education. I am going to teach in an all-white community." Moreover, when we interviewed some of these students while they completed their field experiences, few described their cooperating teachers as having a multicultural orientation. When we observed some of them during their student teaching, we saw very few instances of classroom practices that could be characterized as multicultural.

Like the faculty, most students entering preparation programs for elementary teachers are nonminority students who have only limited knowledge of the concept of diversity. They have grown up in suburban or rural communities where cultural diversity has not been a characteristic of their experiences. Many have indicated that cultural diversity was rarely an item of discussion in their elementary or secondary classrooms. Some have had little or no contact with people of color. When pressed to define multicultural education, most preservice teachers focus on minorities, usually African-Americans, and the problems associated with these groups. A few resent the attention given to minorities, while they believe the plight of other underserved groups (e.g., poor whites, sexually abused children, recent immigrants) is ignored. Moreover, since many do not perceive cultural diversity as a significant goal, they see little relevance in courses on multiculturalism.

MULTICULTURALISM IN TEACHER EDUCATION PROGRAMS

A closer look at the curriculum in teacher preparation programs illustrates just how deeply entrenched in schools of education are the parochial and polemical views of multicultural education espoused by the students quoted above. For the most part, what emerges as multiculturalism is encapsulated in the curriculum. It may be a special course with a title like "Cultural Pluralism in American Society," which might begin with a review of the historical and educational experiences of minorities, offer some educational practices that have been found successful with minority groups, and conclude with the preparation of materials that preservice teachers might eventually use in the classroom. The treatment of multiculturalism may include components of various courses, such as a recognition of Black History Month; brief study of such well-known figures as Chief Joseph, Martin Luther King, Jr., and Cesar Chávez; or discussion of issues of overt or violent racism. When these units are completed, so is the topic of multiculturalism, and the curriculum marches on to other concerns.

An effective multicultural curriculum begins with a broad and comprehensive view of multiculturalism and provides opportunities and experiences for students to recognize and appreciate forms of cultural diversity in their immediate environments. Students can then develop flexible and expanding concepts of diversity with a view toward continuing this process when they become professionals. But it is crucial that, at the outset, preservice teachers be convinced that multiculturalism is a valuable concept that will both help them become better teachers and be personally relevant because they too are part of it. Once preservice teachers understand and embrace a comprehensive view of multiculturalism that includes them, they will be able to see its applications in both heterogeneous and homogeneous classrooms.

A COMPREHENSIVE CONCEPT OF MULTICULTURALISM

Despite the gloom of the picture we have painted, the issues and concerns raised here are not unsolvable. To begin to redress the problems that threaten to choke out multiculturalism as a viable educational issue, we need a view of multiculturalism that transcends the limitations discussed above and that can serve as the foundation for pursuing education-

ELECT
DICK ARK
TO THE
SCHOOL BOARD
SEE DICK RUN
RUN DICK RUN!
SCOTTY

al goals that are both ethical and intellectual in nature. In a previous paper we have defined *multiculturalism* as

> a layered concept that includes not only the experiences of particular individuals and groups but also their shared interests and relationships, which in turn are embedded in the interconnectedness of all peoples of the world. In its full complexity, then, *multiculturalism* implies the cultivation of a global view of human affairs. Paradoxically, perhaps, this expanded view of multiculturalism places primary emphasis on the individual and on the importance of individual decisions regarding all issues concerning the welfare of humankind.[14]

Working with such a comprehensive concept of multiculturalism, we can begin to design an approach to teacher education that will encourage all faculty members to become involved in ways that make multiculturalism pervasive throughout the teacher education curriculum. (At one level it will mean addressing the question of minority representation in education and changing the manner by which education faculty members are promoted and given tenure, issues too broad to be dealt with here.) This involvement will entail clarifying the goals of postsecondary education, especially teacher education, and changing the knowledge base for faculty members and preservice teachers.

CLARIFYING THE GOALS OF TEACHER EDUCATION

The initial step in the development of a multicultural program or curriculum for teacher education is to focus on a broad and comprehensive view of multiculturalism and to employ a set of guidelines in its development that 1) take seriously the demographic profile for the 21st century, 2) strive toward a match between institutional and societal composition, 3) focus on the intellectual needs of education students, 4) embrace a global framework for local and regional issues and concerns, and 5) make equity a primary issue in education.

Education must always be creatively concerned with a balance between the preservation of the values and ideals of a society and the transformation of that society toward the fulfillment of those values and ideals. Because multiculturalism is our national reality, we are best served by an education system that preserves democratic ideals while it helps us move toward a more complete realization of these ideals for all people. Maintaining a balance, however, is not a static process. It involves tension and alternating imbalances, which, registered on sensitive social scales, evoke reactions and further disturbances. The scales tremble rather than hold still.

Teachers should understand that every culture is a kind of argument that stems from certain premises or given conditions.

Education is, then, a continual process of negotiation between the principles of preservation and of transformation. In the area of multiculturalism this dynamism corresponds to the actual diversity of our society. Communities, interest groups, recent immigrants, and established citizens all recognize a particular stake in the education system and in the nature of their access to it. Differential interests are at the heart not only of negotiation and change, but also of identification of what holds true for all. The continual need for negotiation may keep the scales in a state of perturbation, but it also keeps them from tipping too far to one side, resulting either in stagnation or in chaos.

CHANGING THE KNOWLEDGE BASE FOR ALL TEACHERS

Privileging a particular perspective or body of knowledge makes it unnecessary to develop a critical stance toward one's own experience of reality. Multiculturalism, with its multiple perspectives and dialogical communications, is the ideal context in which students can learn to think critically and solve problems; multiculturalism with a global perspective extends this critical thinking and the taking of multiple perspectives even further.

When we consider these ideas in terms of teacher education, we begin to appreciate the significance and immensity of the task at hand. We need a new kind of knowledge base and the ability to translate it into teacher education programs that enable students both to examine critically and to experience the pluralism that characterizes their world and that of their future students.

This knowledge base must include a complex understanding of pluralism, of the nature of different cultures within our society, of the social and historical forces that have acted on them, and of the students' own experiences. This knowledge also needs to be extended beyond our nation and into the world, because our nation influences other nations and is influenced by them. Teachers need to be strong critical thinkers themselves. They should understand that every culture is a kind of argument that stems from certain premises or given conditions, both material and nonmaterial. A rural culture, such as China's, with a quarter of the world's population in a land area similar to that of the U.S., cannot be considered from the same premises as a highly industrialized culture such as that of the U.S. The development of island cultures, such as those of Singapore and Japan, is logically different from the development of the connected nation-states in Europe. The nomadic history of the Arab states has shaped a different world view from that of countries with an agrarian past.

In short, teachers of any subject or grade level should have a broad and synthesized understanding of national and world history, politics, social organizations, and current events. Clearly, the context for such learning must be interdisciplinary. Unfortunately, the structure of most large universities emphasizes boundaries between disciplines, a situation exacerbated by the recent trend of budgetary schemes based on market principles.

Colleges of education, moreover, are likely to be further isolated from the disciplines that provide the historical, cultural, and social knowledge suggested above. As a descendant of two fields, psychology and philosophy, education has developed its hybrid nature in a way that is only now beginning to come together in current theories of knowledge that are social, constructivist, and relational in nature, stressing the importance of the social construction of knowledge within disciplines and cultural contexts. These theories have given us a powerful set of abstractions for developing instruction that is based on multiple perspectives, multicultural literacy, and global awareness. But only the processes of such instruction can be suggested without the interdisciplinary framework to provide the content.

Research on teaching, whether at large institutions that view inquiry as their primary mission or at smaller "teaching-oriented" institutions, must examine more closely and in greater detail the relationships between teachers' professional and discipline-based knowledge. Education students, often among the least seriously regarded students in a university, should become the focus of perhaps the most innovative curriculum yet proposed by undergraduate education reformers: a truly interdisciplinary education, aimed at producing critical thinkers who are multiculturally and globally informed and capable of understanding and addressing the needs of diverse children.

AT PRESENT, multiculturalism in teacher education is "too political" to be of significant educational value for several reasons. First, it lacks the general support of faculty members who perceive multiculturalism as an area for and about minorities. Second, nonminority faculty members, who are the overwhelming majority, avoid issues of race and diversity and do not feel confident (or comfortable) teaching in the area. Third, preservice teachers are not internalizing the principles of multiculturalism. Fourth, strategies employed to "integrate" multiculturalism into the whole curriculum often lead to separatism and/or superficiality and do little to build cohesiveness in a program. Fifth, since the issue of multicultural education is seen as emerging from the political wars of the Sixties and Seventies, mandated by state agencies rather than developing naturally within the education community, it is easily regarded as a political phenomenon and just one more regulation imposed on professional education from above. From this point of view it will, like any fad, die quietly in a decade or two.

Perhaps this last view is correct. With the general decline of support for both cities and schools, urban education and the status of minorities are no longer burning issues. Moreover, there is little pressure on schools of education to address seriously the preparation of preservice teachers in the area of cultural pluralism. But if this view is becoming prevalent, educators should be alarmed. Changing national demographics, if not timeless democratic ideals, suggest that complacency now will sow the seeds of an immense educational failure later.

> Changing demographics and timeless democratic ideals suggest that complacency now will sow the seeds of failure later.

Revolution is not too strong a term for the changes proposed here. Nothing will happen, however, until all constituencies in education really act on their verbal commitments. It is not enough to say that multicultural concepts should improve, that teachers should receive a more powerful knowledge base, or that schools of education should show more courage in addressing multicultural issues, unless all these changes are happening together and in connection with one another.

Multiculturalism includes all of us. It is and always has been the basic fabric of our society, which is not a plain cloth but one with a complex and ever-changing design. Our schools, their programs, and their teachers should reflect the changing population patterns of our nation. Schools of education can either exercise leadership in this effort or continue to provide predominantly monocultural teacher education programs. Pursuing the latter course means sustaining obsolescence. It is time for all educators to become concerned and, indeed, alarmed. Is there a more urgent educational problem before us today?

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A CIRCLE OF SHARING: MAKING YOUR ENVIRONMENTAL EDUCATION PROGRAMS MULTICULTURAL

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> "This we know. The Earth does not belong to man: man belongs to the Earth. Man did not weave the web of life, he is merely a strand in it. Whatever he does to the web, he does to himself. All things are connected like the blood which unites one family, All things are connected."
>
> --Sealth (Chief Seattle)
> Spoken as an admonition to all at the tribal assembly of 1854, prior to signing the Indian Treaties (Caduto & Bruchac, 1988).

A Circle of Sharing

Humans are inextricably intertwined with our environment. As a single thread in the delicate and complex web of life, we are continuously affected by, and in turn impact our surroundings. The term ecology, derived from the Ancient Greek word meaning "household," refers to the relationships between living things and their environment (Cohen & Trostle, 1990). Organisms, including humans, draw life from the Earth and, through death, return to the Earth in a circle of sharing and interdependence. Most North American Indian cultures embrace a belief that all living and non-living parts of the Earth are one, and humans are a part of that wholeness (Caduto & Bruchac, 1988). The Abenaki people of the New Hampshire and Vermont region, for example, have lived in a circle of sharing with the Earth for 10,500 years, teaching their children the importance of giving something back to the Earth whenever they take from her. This conservation ethic is central to Abenaki culture (Caduto, 1989). Today, ecological science agrees with this concept of the interdependence of all life.

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In contrast, Dunlap and Van Liere (1978) have shown that the dominant social paradigm of American society is basically anti-ecological. The dominant European-American culture has espoused an ethic of conquering nature for human consumption and material prosperity. We have essentially separated ourselves from our environment to the extent that our connection with the Earth is no longer obvious. Young people in particular, growing up in a world of concrete, prepackaged food, and drugstore remedies, have difficulty understanding that their survival is dependent on the natural environment (Barton & Washburn, 1991). Though we do not recognize ourselves as participants in a circle of sharing with the Earth, our actions contribute to and are influenced by global change.

Human actions are also influenced to a high degree by culture, "the learned patterns of thinking, feeling, and behaving that make our lives meaningful" (Nolan, 1989). Just as human behavior affects the environment, human cultures develop as a means of surviving within a particular environment. Cultural ecology, refers to the study of the "long-term impact of the environment on culture and of the corresponding human use of culture to adapt to our environment" (Nolan, 1989) in yet another circle of sharing.

Environmental education can positively affect the behavior of individuals by providing information, experiences, and teaching skills which motivate people to act. Because individuals also affect the decisions of groups, the benefits of education extend beyond the individual to family, community, and organizational levels as well. However, to be truly effective, environmental education should be integrated with multicultural education. Individuals must be willing to re-evaluate their own culture, draw on the wisdom, teachings, and beliefs of other cultures, and learn to work together without bias or prejudice across cultures in order to solve local, national, and global environmental problems. As a "global family" we must embrace a stewardship ethic which will ensure the survival of our delicate planet, allowing the circle of sharing to continue. We must examine the relationship between multicultural and environmental education, and identify implications for curriculum and program development.

Multicultural Education

Our nation's demographics are changing, with minority populations growing at a rapid rate (Adachi, 1975). This country is moving from the "melting pot" where people of diverse ethnic backgrounds assimilate into one dominant culture, to a "tossed salad" with a variety of cultures mixing together, each separate in its own right, but all complementing each other to form the whole. It is therefore becoming imperative that interpretation address the needs of this increasingly diverse population.

All people, especially children, deserve to learn in an environment free of bias and oppression, and should be given the opportunity to celebrate human diversity by studying more than just the history and beliefs of a dominant cultural group. To survive in this new society we must learn to appreciate our differences rather than fear them. Multicultural education, therefore, is imperative if we are to meet the challenges of our future.

Connections between Environmental and Multicultural Education

Multicultural and environmental education are connected on a variety of levels and are directly linked to our chances of survival as a society on a planet capable of supporting life. Both educational genre share the common goal of creating social change through affecting the learner's sensitivity to and understanding of pertinent issues, as well as positively influencing the learner's behavior. Both multicultural and environmental education are values oriented and seek to empower the learner to take action in her/his community by teaching problem solving, critical thinking, and action skills (Christian, 1981; Hodge, 1989; Hungerford, et. al., 1980). Multicultural and environmental education are each inherently interdisciplinary and therefore cannot be taught in isolation.

The issues addressed by multicultural and environmental education are of grave importance to everyone. Since the beginnings of the Civil Rights and Environmental movements in the U.S., some people have viewed issues of cultural diversity and equality as pertinent only to people of color. Similarly, environmental concerns have been looked upon as white issues. In reality, we all need to be concerned about the future of our society and our planet; and we need to teach our children to work together to solve problems. Both movements will gain strength by joining forces.

Making Programs Work

Several organizations in the Washington, D.C. area have begun providing multicultural environmental education opportunities for young people. The Model Elementary Science Outdoor Classroom program at Fort Dupont Park, a cooperative venture between the National Park Service and the District of Columbia Public Schools, along with the Smithsonian's Anacostia Museum, and the Accokeek Foundation have each developed a variety of hands-on techniques which encourage urban, predominantly African American, elementary school children to re-connect with the environment and their cultural heritage. Programs involve experiential activities focusing on a number of topics including scientific and historical contributions of African Americans and American Indians; the historical use of edible and medicinal plants; agricultural techniques and their effect on the environment; slavery; folklore; myths; crafts; and the creative arts (Barton, Hicks, & Washburn, 1992).

Adachi (1975) maintains that in order to attain a level of acceptance for living in a pluralistic society, we must gain a deeper understanding of other cultures. He suggests that integrating ideas, traditions, history, and information from a variety of cultures with environmental concepts will enrich curricula and make programs more accessible to audiences of diverse cultural backgrounds. Adachi provides the example of using the Eastern Zen concept of "living use" to teach environmental conservation. The "living use" approach encourages students to internalize and personalize conservation of natural resources, rather than view conservation as something they are told to do.

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It is of vital importance that programs be created that are meaningful and accessible for culturally diverse students. James & McAvoy (1992) and Locke (1990) provide a variety of suggestions for increasing cultural sensitivity and program accessibility. Suggestions include: solicit input from the target audience and community organizations and cultivate partnerships with community members; learn as much as possible about your own culture--you need to understand your own culture before you can appreciate another culture; seek to genuinely respect and appreciate cultural differences and learn as much as possible about other cultures; remember that everyone is a unique individual before they are a member of a cultural group; encourage staff and agency management to institutionalize practices which honor other cultures; develop culturally specific strategies, mechanisms, techniques, and programs; eliminate all your behaviors which suggest cultural bias or racial prejudice and do not tolerate such behavior in others; explicitly address environmental issues directly affecting daily life and the interrelationships apparent within urban settings; increase staff diversity and provide role models from a variety of racial, ethnic and socioeconomic backgrounds; and provide parents with information they might need to encourage their children's interests in environmental issues.

Caduto and Bruchac (1988) state that: "Every one of us is ecologically significant. Our thoughts, feelings, and physical sensations, which give us a sense of identity, are all based on our interactions with the Earth and other people." We must draw on the wisdom of other cultures to shape our future. We can accomplish this by living, and teaching others to live, in a circle of sharing with each other and with the Earth.

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Multicultural Teacher Introspection

Nitza M. Hidalgo

Many educators around the country are interested in developing a multicultural approach in their teaching. They find themselves in classrooms with 25 children of varying racial and cultural backgrounds and are looking for ways to connect what they do in the classroom to the cultures represented by their students. Before we can begin to understand others, however, we need to understand ourselves and what we bring to our interactions with others. For this reason, it is important for teachers interested in learning more about other cultural groups to first look inward.

The initial step in the process involves introspection. Teachers need to ask themselves some fundamental questions: What framework do we bring into the classroom? How does our cultural perspective color our view of the world? Posing these questions helps teachers analyze the deep-rooted cultural features of their backgrounds. Teachers may thus begin the process of understanding how our beliefs and behaviors are culturally based and how our system of beliefs is similar to or different from our students' beliefs.

Many teachers may not be accustomed to thinking of ourselves as cultural or ethnic. This experience is likely rooted in our training and socialization, both direct and indirect, which have been monocultural in nature. The mainstream perspective presented through schooling is really an Anglo-European perspective. Thus, becoming an educated "American" implicitly means becoming Anglicized.[1]

Until recently, schooling in general did not include much information about the experiences of racial and ethnic groups in the United States. Different perspectives were marginalized, often presented as attachments to the main orientation, especially in the area of curriculum. Most practicing teachers have not been exposed to a multicultural knowledge base.[2] When teachers were presented information about racial or ethnic groups, the mainstream perspective was typically used to evaluate the information. It was the filter through which information about diverse populations was interpreted.

Not only has the framework for interpretation of knowledge been monocultural—that is, Anglo-European—but variations have been judged to be less valuable. When African Americans, Latinos, Native Americans, and Asian Americans were mentioned, the deficit model came into play. That model viewed racial and ethnic differences as deficient, or lacking. Children of color were implicitly judged deficient because they did not bring to school the same majority culture represented in the school and classrooms. Without realizing it, teachers learned mainstream or "whiteness" to be the norm by which all knowledge about others was measured within schooling.

Adoption of this mainstream perspective reinforces a lack of ethnic consciousness among a good many classroom teachers. Thus, schooling does not require us to think of ourselves as ethnic and may, in fact, minimize ethnic awareness in favor of Americanization.

The irony is that each of us has been socialized in some culture, and often more than one culture. Our culture provides a lens through which we view the world and interpret our everyday experiences.[3] Culture informs what we see and understand, as well as what we omit and misconstrue. Many components make up our view of the world: our ethnic and racial identification, the region of the country we come from, the type of neighborhood we live in, our socioeconomic background, our gender, the language(s) we speak, our disabilities, our past experiences, and our life-style. We need to think about the ways in which these parts of us define our perspectives.

We may think about culture as existing on at least three levels: the symbolic, the behavioral, and the concrete.[4] Our values and beliefs lie on the symbolic level. How we ascribe meaning to our experiences depends on the values we hold and the beliefs that we may have. This level is the most abstract and difficult to articulate, yet it is essential to our interpretation of the world.

This level of culture is implicit and shared by others within our reference group. Our values and beliefs help us to interpret our experiences and shape socially appropriate behavior. For example, the definition of family may vary from one cultural group to another, depending on the importance the group places on family cohesiveness. The Puerto Rican concept of family may go beyond the extended family to kinlike relations with friends (compadres/comadres), while the U.S. American definition of family may include only the nuclear family living at home.[5]

The behavioral level refers to how we define our social roles, the language(s) we speak, the rituals we practice, and the form taken by our nonverbal communication. Our behavior reflects our values. The roles we ascribe to women and men within U.S. culture are different from the gender roles of other cultures. Even within our culture, for instance, the role of women has undergone subtle modifications because of the women's movement. These role ascriptions are based on our beliefs, as a society, about the importance of women's work and their contribution to the household. In response, men have also had to redefine their roles within various situations as evidenced by the development of parenting, rather than solely maternity, leave policies. Thus, it is evident that culture is a dynamic, not static, process.

Also on the behavioral level, language mirrors thought; our language reflects our beliefs and values. Think about the associations we make with simple words like black and white. Is it sheer coincidence that we can generate many negative connotations for the word black and many positive connotations for the word white? Regarding language, the feminist movement has worked to eliminate commonplace correlations such as men and girls (versus men and women) because of the inequality inherent in this type of comparison. These are subtle distinctions that have profound effects on our thinking.

Educators often begin to think about multiculturalism at the concrete level, yet movement to a more abstract understanding is needed. The concrete culture is the most visible and tangible level. The products of culture, such as our cultural artifacts, exist at this level. Technology, music, foods, and artistic works and materials are the concrete, visible elements of culture. This is what is most often interpreted as "the culture" of ethnic groups. School festivals highlighting ethnic foods, flag displays from different countries, performance of ethnic music, and playing international games tend to result in a superficial and exotic impression of multiculturalism. This would be comparable to French students expecting to learn about U.S. culture by studying our ritual practices on the Fourth of July. Knowing about barbecues and fireworks displays tells French students little about the meaning Independence Day has in our nation. Foods, holidays, games, and artifacts reveal little about how ethnic groups experience and make meaning of the world.

Given this definition of culture, we can begin to explore how our own cultural perspectives shape our thinking and actions. In order to answer eventually the broad question of how our cultural perspective influences our work in the classroom, we begin with specific introspective information gathering. A preliminary exercise in staff development work with teacher groups requires that we locate ourselves by region, ethnicity, and family system. The exercise requires teachers to respond to the following questions.[6] Where were you born? What language(s) or dialect(s) were spoken in your home? Where did you grow up? Describe your neighborhood. What is your ethnic or racial heritage? Was religion important during your upbringing? If yes, how? Who makes up your family? What traditions does your family follow? What values does your family hold dear? How do the members of your family relate to each other? How is love expressed? How is your culture expressed in your family? These preliminary questions can help teachers begin their introspection by locating themselves in a framework familiar to them—their family background.

The processing of answers derived from this exercise allows us to become located in our personal social constructions. Teachers can thereby reflect on our conceptualization of family, using social roles and behavior within different families. Becoming aware of our definitions may help with the understanding of alternative definitions of family. Meaningful insight comes from having to think about our backgrounds and then sharing this information with others. From sharing, we gain an awareness of the similarities and differences between the various definitions. Derman Sparks[7] recommends that teachers form a support group of colleagues to facilitate the introspection process. In most instances, we learn that despite diversity of meaning, family and community provide us with social safety nets that we can return to when needed for security and connection to others. This kind of exercise, which explores differences and similarities between ethnic and racial groups presents insightful alternative ethnic and cultural interpretations for teachers. We begin to understand our similarities within our diversity.

Once we have thought about the preliminary questions, a deeper level of introspection can occur. After locating ourselves within a particular family and neighborhood, questions related to the individual should be considered. The questions to think about may include: What is our cultural heritage? How does our cultural background influence how we perceive and understand others? What are our values and beliefs? How do our values influence our behavior toward children? How does our socioeconomic class frame our view about children in poverty? What is our definition of normal? How do we think about differences in children, and do we implicitly relate difference to deficiency? Do we believe there are gender differences in certain types of cognitive or physical abilities? Do we think all children can learn?

These questions do not have simple answers. They touch upon many issues that we may not even be able to talk about, specifically, our values. The aforementioned questions are not related to value clarification, but will reveal our implicit cultural and social constructions. Because some aspects of culture are so ingrained, introspection is required to discover how our attitudes, behavior, and interactions are affected.

For example, through introspection, a teacher may discover she believes, like many U.S.-born Americans, that individuals are the basic building blocks of society. As a society, U.S. families rear children to be independent individuals. We hold individualism in high esteem. In contrast, many Puerto Rican parents believe that the family's welfare comes before that of any individual member; the Puerto Rican definition of individualism takes a different form. Puerto Rican children are reared to value interdependency and to hold family obligation in high esteem. These conflicting beliefs may surface in a classroom when a student (especially a female) is absent from school for an extended period to care for younger siblings. Uninformed about the cultural value of interdependency, the teacher may think the child's parents do not value education. In fact, Puerto Rican parents highly value education and encourage their children to succeed academically.[8] The teacher's reaction to this situation may be based on how the ingrained nature of our cultural beliefs interrelate with our learned societal conceptions.

A number of outcomes may result from the introspection process: teachers may sense a lack of true cultural understanding, or they may feel disadvantaged. When asked to define themselves ethnically and culturally, some educators have a very difficult time. Many lack an ethnic consciousness. The difficulty often stems from previous schooling and socialization since the Anglo-European perspective in schools defines the average "American" as one who is White. Although ethnicity and race are distinct social constructions and ethnicity is an essential part of culture, being ethnic in the United States is implicitly defined by some educators today as being non-White. This belies the experiences of

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many U.S. citizens, such as those of Italian and Irish heritage who are White ethnics.

Being "American" seems to be cast as a denial of ethnicity. ethnicity is generalized as an exotic, cultural trait. It often seems that to be "American" is to be nonethnic, when in fact it is closer to being a-ethnic, a consciousness related to the melting-pot myth that requires a loss of ethnicity in return for membership in mainstream U.S. society.

A melting-pot formulation leading to Americanization can be seen as the result of combined ethnicities cancelling each other over the generations into "Americans." The melting-pot theory is not equally accepting of all ethnic and racial groups. While the contributions of ethnic groups are supposed to compose the common core, when one examines the "common culture," the core is primarily Anglo-European values, beliefs, and achievements. For example, as Americans we commemorate holidays such as Thanksgiving, a celebration of ancestral survival (and its underlying values of determination and hard work), but the reduction of Native Americans to second-class status which facilitated ancestral survival is not acknowledged. The subtle message is to become "American" is to be nonethnic.

On occasion, introspective teachers communicate a sense of disadvantage from our own schooling. We sense that past knowledge presented to us has offered only a partial picture of our multicultural heritage. We have received only a partial education because our schooling was monocultural in nature. We feel the loss of a significant part of our history, a loss which denies us a fuller sense of humanity and citizenship because it has distorted the importance of Anglo-European traditions by omitting diverse contributions to our society. We realize that exposure to alternative interpretations of reality may dispel the sense of superiority implicitly taught to mainstream citizenry and may better promote egalitarian social relations between people from different backgrounds. Some teachers decide this blockage to our true humanity is something we, as adults wishing to gain a multicultural awareness, have to break down.

Introspection also creates cognitive dissonance for teachers when we must reconcile differing versions of reality. This experience can be so powerful because teachers realize that the information we trusted and believed in may be only partially true and that varying cultural interpretations demand we accustom ourselves to more ambiguity. The dissonance can cause us to adjust our existing framework of knowledge and certainty. We can no longer be satisfied with easy answers because through introspection and sharing come deeper insights into the complexities of a multicultural society.

Understanding and facing the complexity of a multicultural society, where there is no one way to do things, promotes critical thinking capacity. We begin to think critically about ourselves, our beliefs, and our histories, and, consequently, about how our beliefs are framed by societal constructions. We begin to recognize the implicit power attributions unequally assigned to cultural groups in the United States. We have to move beyond ourselves as individuals because we have been socialized within a particular society that shares a common history. The process of examining our assumptions and beliefs results in a critical awareness of past and present U.S. contexts.

Asking introspective questions can lead to an intellectual awareness of the functions of culture. Teachers need to go beyond a cognitive awareness of the influence of culture to an affective understanding. Knowing something in the abstract is insufficient to the awareness we seek; we have to be able to empathize with the experiences of others. Knowing about inequality in the abstract, believing in the principle of equality, is only a first step toward the multicultural awareness needed in classrooms. We need, for example, to put ourselves "in the shoes" of new immigrants facing institutionalized prejudices to feel their reality. The goal is to complement our intellectual introspections with affective understanding. We need to transcend thinking about differences to achieve an emotional connection. Although we can never know another's cultural experiences in the same way as the person who undergoes those experiences, we can achieve an emotional empathy along with an intellectual awareness.

The understanding we seek goes far beyond learning about traditional holidays and ethnic foods, which are the more concrete levels of culture. Once we understand how culture shapes our perspective, our inquiry shifts to the classroom to examine how our beliefs influence our behavior. The questions to pose can be general, or directed toward a particular topic which arises in classrooms daily, such as discipline or teacher/student interactions.

A general question would be: How are our values expressed in classroom dynamics with children? More specific questions related to the areas of authority and discipline are: How do we perceive authority? Does authority come with an ascribed role? For example, does the role of teacher automatically give teachers respect, as in the U.S. American culture, or must respect be earned through the behavior of the person fulfilling that role? What do we consider appropriate behavior for children when interacting with adults? For example, when being reprimanded, do we expect children to look an adult in the eyes or to look down to show respect, as in many Latino cultures? These classroom dynamics inherently shape teachers' expectations of children, but are rarely examined from a cultural perspective. Having clear definitions of appropriate behavior facilitates problem-solving when differing behavior is encountered because we have information on our cultural interpretations to compare and contrast to other interpretations. A critical awareness of how culture functions in the classroom demands, as a first step, teachers' insight into our own culture.

Teachers' sustained interactions with children affect how children feel about school. To understand how cultural background designates particular forms of verbal and nonverbal interaction teachers may ask: What kinds of verbal and nonverbal interactions would we consider appropriate between children and the teacher? Specifically, how do we use touching behavior in the classroom? For Puerto Ricans, touching behavior exists within most interpersonal communications.[8] Puerto Rican children expect a lot of touching and hugging behavior from adults they trust; touching behavior is interpreted as an expression of liking for children. Each of these questions invites a comparison to the cultural perspective the teacher brings to the classroom. If we begin with our own perspectives and what shapes them, we then have a basis for comparing differences and similarities between our perspectives and those of our students.

The teacher introspective process occurs in different phases; completing each phase moves teachers closer to the next phase. The first phase examines cultural and social values, both on an individual and societal basis. The second phase situates awareness on an affective level. The third phase transposes teachers' values and behavior into the classroom context. Each phase is interactive with the preceding and following phase. At each phase, teachers should work not in isolation, as we do in so many other professional processes, but in support groups or teams. Within the safety of a supportive environment, teachers can more productively examine our cultural values, beliefs and assumptions. We can share our findings with each other and gain wisdom about the power of cultural diversity.

Efforts to infuse multicultural awareness into a professional development program for teachers have expanded in recent years, largely due to the increase of immigrant children and children of color in public schools and to a growing awareness of the significance of multicultural education reform. School should create the environment which fosters teacher development for teachers to be able to replicate multicultural awareness with their students.[10]

Teachers need to become introspective ethnographers in our own classrooms to decipher the cultural meanings that we and our students bring to the group. Once teachers understand our assumptions and beliefs and can appreciate and accept the unique cultural contributions of our students, we can use this knowledge to mediate effectively between the children's culture and the other cultures represented in the school.

Acknowledgment

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Building on the Strengths of Urban Learners

Belinda Williams and Ellen Newcombe

The Urban Learner Framework offers a positive portrayal of urban learners and charts a direction for understanding the complexity of school change.

By age 18, Russell was a millionaire.[1] He lived in a penthouse and owned a Maserati, a Porsche, and a Rolls Royce. An entrepreneur, Russell developed an empire that employed more than 100 ghetto youths. But his business was based on a commodity that was illegal.

When he entered elementary school, Russell was a bright-eyed, attractive child eager to learn, despite scoring low in school readiness tests. He knew his numbers, and his 1st grade teacher described him as a "hard worker." After being assigned to remedial reading instruction, however, Russell never quite caught up.

When school authorities made a home visit to investigate his frequent absences, they were not prepared for the deplorable situation they found. Drugs, crime, and unbelievable filth prevailed in the welfare hotel where Russell lived with four younger siblings, various relatives, and several friends of his mother. Two of his cousins were already in trouble with the law, and most of the people living there were on drugs, although Russell's mother was drug-free.

Russell continued to work hard, however, and to take pride in his successes. But, as the years went by, teachers stopped saying positive things about him. Russell seemed to stop trying. His focus changed from academics to social interactions with his peers, leading to several negative incidents. In one, Russell was suspected of being the ring leader of a group that stole lunch money from other students. He also helped organize a betting pool around intramural sports.

Because of his history of antisocial behavior, 10-year-old Russell came to the attention of the child study team. Reluctantly, the team classified him as "emotionally disturbed" and placed him in a special, self-contained class with other disruptive youngsters. Soon, Russell stopped coming to school altogether. His mother reported that he had run away. Russell became another sad statistic of the school district.

> An entrepreneur, Russell developed an empire that employed more than 100 ghetto youths. But his business was based on a commodity that was illegal.

Reprinted with permission of Association for Supervision and Curriculum Development, Due for Publication in August 1994, Williams, Belinda, and Ellen Newcombe. "Building on the Strengths of Urban Learners," *Educational Leadership*, May 1994.

Eight years later, Russell came into the national news media spotlight when he was arrested. Over a four-year period, Russell had developed a significant drug empire. As a gang leader, he franchised locations to friends in return for a percentage of the profits. He also rewarded shift bosses with the rights to a percentage of the profits from a corner or drug house. Most of his dealings were from "gatehouses," illicit fast-food outlets for drugs. Russell's associates were able to elude the police by moving from one abandoned building to another.

Until his arrest, Russell had built and managed a successful undercover drug organization that eluded the police for nearly five years. But his illegal dealing finally came home to roost.

More of the Same Won't Work

Most of us working in urban education have known many Russells. The most salient point about Russell's story is the mismatch between the strengths he brought to school and the school's ability to respond. While Russell's talents made him extremely successful on the street, they alienated him from school. Clearly, thousands of urban students have abilities like Russell's that are not recognized by schools.

At Research for Better Schools, we are engaged in a long-term effort designed to put real meaning behind the words "all children can learn."[2] Tracking, remediation, additional programs, and increased budgets haven't closed the achievement gap between poor urban minority students and majority culture students. More of the same certainly isn't the answer.

By critically reviewing the research, consulting with other educators, and testing our theories in practice, we have developed a framework for looking at urban students that emphasizes the differences, experiences, and strengths that they bring to school. Our Urban Learner Framework underscores four assumptions that present a new positive characterization of urban learners (for example, capable, motivated, able to build on cultural strengths) and reverses negative labeling of them (lacking ability, culturally deprived, unmotivated, at risk). We feel these assumptions must guide all decisions about urban learners:

- Culture and cognitive development are interrelated.
- Education must foster the full potential of every urban learner by appreciating group membership and individual diversity.
- All educational systems must value and care for the learner and the community.
- All individuals are both learners and facilitators of learning.

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Using the Framework

To increase urban educators' understanding of the implications of these assumptions, the framework focuses on four themes.

1. Urban students bring to schools cultural strengths and learning experiences that must be reflected in curriculum, instruction, and school routines. Culture is a more powerful explanation of differences between student groups than either genetics or socioeconomics (Banks 1988). By culture, we mean the traditions, language, and daily experiences of the home and community. (Ladson-Billings 1990, Tharp and Gallimore 1988, Tharp 1989, 1992). Educators need to align curriculum, instruction, and school procedures to support the needs of urban learners.

2. Culture plays a fundamental role in cognitive development. While many of us were taught that intelligence was genetically determined, unitary, and fixed at birth, psychologists now argue that intelligence is modifiable, multifaceted, and mediated by the cultural environment.[3] These new understandings have clear implications for urban educators (Gardner 1993, Sternberg 1985).

3. Motivation and effort are as important to learning as are innate abilities. Urban students will benefit from school environments in which they can learn from their mistakes, are effortful in their learning, and fully engage themselves (Bernal 1992, Stevenson and Stigler 1992).

4. Resilience is a characteristic of urban learners. Despite adverse conditions, many urban children grow into healthy, responsible, productive adults. These "resilient" children display characteristics of social competence, autonomy, problem solving, and a sense of the future. Many educators need to revise their perspective of urban youth from students at risk to learners displaying resilience (Benard 1991, Winfield 1991, Rutter 1987).

Our framework integrates a new vision of the urban learner with four areas central to the functioning of schools. Using the themes as a guide, urban educators can conduct needs assessments and prioritize strategies in these areas:

- *Curriculum, instruction, and assessment.* When curriculum and instruction are tied to the cultural experiences and values of urban students, schooling becomes more meaningful for them. Schools need to design assessments of these new learning experiences that go beyond standardized paper-and-pencil tests.
- *Staff development.* To begin to value and build on the experiences and strengths of urban learners, educators must think, feel, and behave in new ways. Staff development programs often serve as catalysts for teachers to make the kinds of cognitive, affective, and behavioral changes that will foster the success of urban learners.
- *The school environment.* Schools organized to assure high expectations, a challenging curriculum, a caring climate, and positive self-esteem are more likely to develop individual potential and promote growth and learning in all students. Likewise, community members, local district administrators, state and federal agencies, legislators, and other stakeholders must contribute to these efforts.
- *Management.* Through increased school-home collaboration, shared decision making, and other strategies, districts and schools can increase the awareness of school staff about the experiences and strengths of urban learners.

Needed: Creative Solutions to Complex Challenges

While the Urban Learner Framework started out as a theoretical foundation in two school districts—Washington, D.C., and Camden, New Jersey—the framework serves as one of the key components of the reform agenda for systemic change. Staff developers, teachers, and teacher mentors in these districts are exploring how teaching and learning practices can value and build on the strengths of urban learners.

This year, with our district partners, we are developing strategies to identify and define the learning experiences of culturally diverse urban student groups while recognizing the multiple intelligences of every individual. We are also exploring ways to use this information as a bridge to new classroom learning. As we expand our own knowledge, we will incorporate these new understandings into the framework.

Not surprisingly, the experiences of our staff underscore what others have found—namely, that urban school change is always difficult, complex, and long term. Many researchers believe that current programs for urban restructuring lack sufficient depth and will not significantly affect current urban achievement patterns (for example, Asher 1993, Haberman 1991). Our district partners agree and typically find the Urban Learner Framework a useful, substantive addition to other major efforts such as decentralization, site-based management, and curriculum integration. We know that quick fixes, fragmented efforts, and add-on programs that do not focus on the learning experiences of urban students will not significantly change dropout and achievement patterns.

Along with our partners, we are encountering many challenges that will need creative solutions developed in cooperation with urban educators. Some of the barriers to change we have experienced include the following:

- *Belief systems.* The Urban Learner Framework requires, for many, a change in beliefs about culture and intelligence, the abilities of urban students, and the teacher's role. To change beliefs and practices that were determined by early socialization will require long-term attention. By showing their support for teachers' efforts (for example, time for teacher inquiry and collaboration) and by demonstrating the use of the framework's principles in their decision making, school leaders can take a first step toward achieving a more enduring form of change (Pajares 1992).
- *District, state, and federal regulations and policies.* In some districts, the rigidity imposed on student classroom experiences severely limits reform. If change is to flourish, regulations and requirements must be relaxed or waived, and assessment and accountability need to be determined not by achievement test scores alone, but by alternative measures as well.
- *Multiple reforms.* Another barrier in urban districts is the plethora of improvement initiatives taking place that lack a central focus on urban learners. The Urban Learner Framework can support other restructuring efforts, such as site-based decision making and new curriculum content standards, and supply a common focus—the urban learner.
- *Sufficient time.* It takes time for educators to learn about the cultural experiences of urban students and to

Figure 1

Toward a New Vision of Urban Learners

Current View	A New Vision
Deprived	Culturally Different
Failing/Low-Achieving	Unrecognized Abilities/ Underdeveloped Potential
Unmotivated	Engaged/Self-Motivated/Effortful
At-Risk	Resilient

participate in the professional development needed to reshape their teaching. It takes time to discuss related issues with colleagues, parents, and community members. And it takes time to make good decisions and to carry them out. The lack of time to assimilate new knowledge and to bring about change is a significant barrier in urban schools.

Meeting the Challenge in Urban Districts

Many urban educators we have worked with recognize the importance of an organized presentation of the current research and theory about the teaching and learning process and the nature of cultural diversity. They realize that the Urban Learner Framework is not just another program promising a quick fix. As one teacher mentor put it, "This is not a program. A program has a beginning and an end ... a life span. This is a movement.... we're looking at a distant light. We must not only change our attitudes about urban learners, but our teaching styles must change also."

We at Research for Better Schools and our two district partners are exploring whether schools can use the Urban Learner Framework to provide educational experiences that enable students to achieve academic success without forsaking their cultural and racial identities. The would-be "Russells" can then become lifelong learners, able to lead productive lives and contribute to the social and economic fabric of their communities and society. ■

When curriculum and instruction are tied to the cultural experiences and values of urban students, schooling becomes more meaningful for them.

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[1] "Russell" is a composite view of several adolescents who dropped out of public school in a large eastern city.

[2] The work discussed here represents a joint effort of all staff of the Urban Education Project at Research for Better Schools.

[3] See, for example, Gardner 1993, Sternberg 1985, Feuerstein 1990, Vygotsky 1978, Moll et al. 1992, Tharp 1989, Rogoff 1990, Cole 1985.

EEAC

ENVIRONMENTAL EDUCATION ADVISORY COUNCIL NEWSLETTER

SPRING 1994

Valuing Human Habitats

By David L. Cohen

The 1993 New York State Outdoor Education Association (NYSOEA) conference at Lake George was, with one exception, the uplifting event it invariably is for me. It afforded me an opportunity to network with environmental and outdoor educators from around the State. The formal learning opportunities provided by the workshops and the informal learning during the social events gave me much to think about.

I returned to New York City better equipped to meet my responsibilities as leader of two environmental education organizations, President of Educators for Gateway, and Co-Chair of the United Federation of Teachers Outdoor-Environmental Education Committee. The conference also gave me some fuel for my new position as a curriculum coordinator in my school district. The conference met my high expectations with one glaring exception and that was the unfortunate multi-media show that was presented one evening to all the conference participants.

This very powerful show, professionally done and involving about a half dozen projects and live and taped, music, was intended to be a tribute to the beautiful Adirondacks State Park. I had spent three summers canoeing lakes of the Adirondacks so I already know of their great beauty. The photography was exceptional and the production values reflected the highest standards of professional photographic presentation. The only problem with the presentation was that, in order to highlight the great beauty of the Adirondacks, the photographer began with thirty seconds of slides that denigrated New York City and, by extension, all urban environments.

The show began with a bus leaving New York City and many slides showing only the undesirable aspects of city life. There was litter, graffiti, and a rat poison sign in a vacant, trash-littered lot. The accompanying sound track was not music but the noise of trucks and cars. There was one slide of the bus on the Thruway and then finally, the bus pulls up in front of a "Welcome to the Adirondacks" sign. The sound track now has bird calls. The mist rises from a lake. It is morning and sunrise, or evening and sunset but, sunrise or sunset, it is perfect. We are saved from the horrors of urban life.

As environmental educators we teach about connections and interdependence. The web of life is a key environmental concept. We also learn to value the habitats of each creature and the critical role each member of a community plays in maintaining a viable ecosystem. As the creatures of non-human systems all depend on each other, so do we creatures of the human systems depend on each other. It is only when we develop and inculcate the same respect for human habitats as we do for those of fish and birds and mammals that we will begin to effectively address living in harmony with the non-human organisms of this planet.

The city is one of the natural habitats of humans. In fact, cities are the main human habitats. In this country, however, there is a history of not valuing urban life. The realization of the "American Dream" is a single family home in the suburbs with, if you are really lucky, a second home off in the woods somewhere near a stream or at the top of a mountain. Even many urban dwellers believe this.

We blind ourselves to the vitality that abounds in cities as centers of learning, art, culture and economic opportunity. We accept the crime, litter, pollution and poverty as inevitable confirmations of the sinfulness of cities. In accepting these, we keep ourselves from effectively addressing their root causes which are not urban life itself but a lack of collective will to make cities humane habitats. We allow country and city cousins to be played off against each other and, in cooperating with this game, all have less quality in our lives.

Continued on page 5

EEAC is a voluntary organization in support of Environmental Education for New York

Reprinted with permission of Environmental Education Advisory Council of New York, Due for Publication in August 1994, Cohen, David L. "Valuing Human Habitats," *Environmental Education Advisory Council Newsletter*, Spring 1994.

Dear Ruth Eilenberg:

Thank you for forwarding a copy of *You Can Make It Happen*. I am glad to hear from you.

The EEAC Youth Congress has had an impact on my career aspirations. I am currently in my third year at Rutgers University pursuing a double major in Environmental Planning and Design and Human Ecology. If you need any assistance with future EEAC Youth Congress events, I will be happy to help.

Very truly yours,
Marianne Shaffer

Ruth Eilenberg is the Treasurer of EEAC and was the leading force behind it's Youth Congress held April 1990. Marianne Shaffer was one of the students who participated in the Youth Congress.

Valuing Human Habitats continued from page 1

Travel in Europe and you will find many developed nations that have learned to value both the urban and rural human habitats. Holland, the most densely populated nation in the world, does not have the kinds of slums or the kinds of poverty that exist here. Every square centimeter is accounted for and there is no wasted land - fields left with rusting automobiles or piles of tires. Every effort is made to preserve nature, that which exists in urban areas and that which is removed from cities.

We are entitled to our preferences. I may prefer to live in a small town, or off in the hills at the end of some dirt road, or in a town-house in Syracuse or Binghamton or even New York City. Whatever the preference, we must, especially as environmental educators, remember the connections and teach our students to respect, value and have care for all the different kinds of human habitats.

I asked the photographer who produced the slide show why he needed to present urban life so negatively. Could he not simply highlight the positive aspects of the Adirondacks? And why was he so willing to take the negative aspects of Adirondack life, like poverty, and give them a character-building quality? Does growing up poor in a trailer in a region with relatively few economic opportunities hold more promise than growing up poor in a city where there are so many more chances to pull oneself from poverty? When immigrants come to America they do not move to the country but get their start in cities.

The photographer said that he did the slide show that way because it was the way he saw things. In addition to the remarkable vitality of the built urban environment, this photographer also failed to see the plant and animal habitats that we have in our cities in great abundance and diversity and how much we enjoy these habitats. New York City enjoys forests; a variety of aquatic habitats including ocean, bay and river; interesting geologic history; and two of the most important sites in the world for bird enthusiasts.

Other NYSOEA members with whom I discussed my concerns agreed that the show would have been far stronger had it not begun with the shots of unattractive parts or urban life. One said that having such a program was really a positive experience just as an anti-mode. This photographer, though not malevolent, was a victim of cliches; the cliche that country is good and city is bad; the cliche that country is moral and city is sinful; the cliche that human-built is harmful and bad and that not-human built is good

If we are to be effective as outdoor and environmental educators, we must disengage ourselves of these cliches and promote the same kind of healthy self concept for human habitats that we promote for individuals. You can be what you are, in terms of gender, ethnicity, and religion, value who you are, and respect and value and learn from the diversity of others. Diversity is healthy and positive. This holds as true for a human habitat as for a pond. Anyway, it's all natural, from the mountains of Manhattan to the mountains of the Adirondacks.

This presentation did not deserve the venue of a NYSOEA conference. It perpetuated unfortunate and distorted stereotypes that only divide us and prevent the effective addressing of the real obstacles to progress, our own ignorance. This slide show was not unique. There are too many books, films advertisements for camps, and environmental educators who, in their presentations, never bring balance to what they convey, specifically or by implication about urban habitats.

Finally, by learning to value the urban habitat, whether we live there or elsewhere, we most effectively do what I assume the photographer wanted to do, which is to preserve more of the Adirondacks as a low human impact area.

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TALBERT SPENCE ON URBAN E. E.

Seeing Rich Lessons Within Big Cities

by Mike Weilbacher

Like a bald eagle perched high in its aerie, Talbert Spence nests in an apartment in upper Manhattan that commands an eagle's-eye view of the Hudson River. The view is green and blue, trees and water, not what one expects of Manhattan, the heart of Megalopolis. But then, cities are always surprising. Binoculars patiently wait for Spence on the windowsill.

And like an eagle, Spence is rare. He has crafted a successful career as a science and environmental educator amidst the urban sprawl of New York City, not exactly the Mecca of environmental education in North America.

But, he's a resource worth cultivating, for few people on the planet need the work of environmental educators more than residents of big cities like the Big Apple.

Spence serves the New York Academy of Sciences, an organization of more than 50,000 scientists from around the world, as Director of Educational Programs, a position that allows him to be a "facilitator of science for people," as he describes it. The Academy coordinates all National Science and Technology Week programs in New York City, trains teachers through the Science Institute for Teachers, administers the New York City School Science Fair annually, and runs the Junior Academy, an organization of 1500 junior and senior high school students who sustain each other's interest in science through lectures, field trips, and more.

Talbert Spence

For 10 years prior to this, Spence was the Education Director of Wave Hill Public Garden, a Bronx botanical garden that provides extensive field trip experiences for city students. He's also spent three years coordinating programs at the American Museum of Natural History, taught junior high school science in Toledo, and helped edit "Environmental Education Activities Manual" by William Stapp and Dorothy Cox, a volume that occupies a prominent place on many nature center bookshelves. Spence received his Master's under Bill Stapp at the University of Michigan in 1973.

Also like an eagle, his eyes are active and alert, always watching for new trends, developments, directions. His eyes are thoughtful as well. At Michigan, he was able to watch — and participate in — the debates that gave rise to formal definitions of what environmental education was. With Stapp, "I got a chance to quietly listen to viewpoints on environmental education" from national leaders coming through Ann Arbor. Through watching and listening, he formulated his own ideas of what EE could do.

For unlike an eagle, there's not a predatory bone in this man's body. Nicer people are hard to find. He's a nurturer, a network-builder, someone you're likely to meet up with at national EE conferences, someone in touch with a wide and deep network of educators in New York and elsewhere, always ready to collaborate on a project. His professional involvements include chairing the Sub-Committee on Minorities in Environmental Science Professions of the North American Association for Environmental Education, and serving as Vice President of the Alliance for Environmental Education. He's a Past President of the American Nature Study Society as well.

And unlike that eagle, he speaks quietly, carefully, in measured words. You get the feeling that he would make a wonderful Supreme Court Justice. Yet the passion and commitment he applies to his work shines through his eyes and underscores — infuses, to use educationese - his words. He loves teaching science, loves "having a hobby and a job that's the same thing."

NSYF chose to highlight Talbert Spence for this feature on urban environmental education because he is peerless in his combination of understanding the urban environment and environmental education, and his long experience in the field and the respect he commands among fellow professionals compel us to provide him this pulpit, as it were, from which to speak. NSYF Associate Editor Mike Weilbacher interviewed him in his home in November.

NSYF: As a professional environmental educator who lives and works in New York City, how well has environmental education addressed the needs of the residents of cities like New York?

TS: I need to answer this in pieces. For one, if any individual or teacher wanted to pursue a given topic in the environment — any topic at all — it could happen in this town, because we have just about every conceivable potential resource on air, water, solid waste, land, forestry, any of these. We have the Hudson, the estuaries. It's all here; it's all possible.

Another piece of the answer goes back to the first Earth Day in 1970. We had a big event here and a lot of grass-roots advocacy-based organizations emerged, and a core of them have survived and stayed in the city. These are not your Sierra Clubs or Audubon Societies. I have some difficulty with some of those organizations because they haven't to this day focused on the urban constituency. Rarely do they pinpoint critical environmental issues that are impacting on people living in the city. But the year before I moved here, in 1973, the Environmental Education Advisory Council formed as the environmental ed advisor to NewYork City Public School. It's made up of organizations like the Environmental Action Coalition, a group whose focal point is solid waste and open space. The Council pulls everyone together into one forum where they share information, then get the information into schools and into the community.

Museums in the city, like Wave Hill, have taken the charge to provide specific kinds of services in the environmental field. Botanical gardens, zoos, the city's Parks Department all have strong environmental programs. Urban park rangers are trained in EE, and so urban parks become locations for a variety of public events, field trips, and programs for all ages, some focusing on basic concepts, but also opening the eyes of those who participate. In a city like New York, there's such diversity in the environment.

NSYF: So overall, how well have we been doing urban EE?

TS: Speaking only for this city, I can say we've made a dent, but

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Reprinted with permission of Natural Science for Youth Foundation, Due for Publication in 1994, Weilbacher, Mike. "Talbert Spence on Urban EE: Seeing Rich Lessons Within Big Cities," *Natural Science for Youth Foundation Newsletter*, 1988.

TALBERT SPENCE (Cont'd From Page 5)

not to the extent I would love to see. In our public schools, EE is a sanctioned activity, and that's positive. Though there's no Office of EE in city schools, there used to be an Office of Health and Physical Education which had some folks who were involved in EE, and they helped establish the Gateway Environmental Education Center in Gateway National Recreation Area, staffed by Board of Education personnel, yet on federal property. It's not limited to just NYC Public Schools, but 90% of its visitorship is those kids. Teacher training goes on out there. We've got a collaboration with a big 4-H program in the city now, and Cornell's Cooperative Extension Service has an office here in the city. And universities here are rich in opportunities for staff development, and several have EE programs.

NSYP: What does someone growing up in Brooklyn or the Bronx need to know or understand about the environment?

TS: They first must learn about the urban systems they live in. Immediately. Their neighborhood; their building. They need to know how to get from one place to another — survival skills, esentially, knowing their particular neighborhood. The kids who use the school across the street should know how to get there, where it's located, and that their parents are involved in it.

What they probably don't know are the other systems that make the city function: water, transportation, and electrical systems; where the garbage goes; air quality; those kinds of things. There are some animals living so closely to us we get to do major studies on them, the critters running around our apartments. Most of us are very adept at whacking insects, especially roaches. If you talk about urban wildlife, most people will respond "rats, roaches, mice," negative things. Most kids don't know pigeons are rock doves and there's specific reasons why they like to perch on buildings. We have to teach them about the systems and the resources around us, and how they are part of it. Their forests are the very large buildings. That's the environment they are in; that's what they see daily.

We need to fine-tune their senses to block out all of the negative noises, because they're bombarded constantly with noises, a lot of stimulus — TV stimulus, walking-down-the-street stimulus, people gunning their motorcycles on the parkway at 2 a.m., all that.

NSYP: You've got the Hudson River right here behind your building. What should we teach the urban child about that river?

TS: I grew up in the city of Chester, Pennsylvania. I had the Delaware River no more than four blocks away from my house. I never fished there. I never learned anything specifically positive about why the river was there, or the importance of that river to my life. All I learned was that William Penn landed somewhere there, that kids drowned there, and my grandfather taught me about commerce and the steel mills because he was involved in that. We need to do more.

Rivers Can teach about water and where water comes from. Ask a kid, and they'll go, "Well, I turn on the tap and it comes on." So where does it come from? The Hudson, or the Catskill Mountains 100 miles away? You have to begin to fill in the deficits, link them together, broaden the scope of information, and widen it so they begin to see a global view, yet one that connects to their bathrooms. I'll give you an idea of what I mean.

A couple of years ago, we had a drought, and we were coming up to the summer season. So Mayor Koch deputized every elementary school child as "Deputy Mayor for Water Conservation," and every kid took home a button, a poster, and a checklist of ways to conserve water. Teachers and principals got behind it. The press covered it extensively, so adults saw this on the evening news and in the newspapers. Well, the deputized kids went home, and there was a reduction in daily use of water, OK? Simple things make a difference. Our ability to touch the lives of every child is impossible, but through a variety of mechanisms that included the media, we came close. At some point in each child's travels through the school system or the city he'd get hit with a gesture or event that maybe stimulated a change in his behavior.

NSYP: When "urban environmental ed" is applied as a term, it usually seems one of two things is happening. The first is taking the urban learner out of the urban setting on a field trip. The second is doing nature study — wildflower ID, birdwatching — in parks and vacant lots. Is that "urban EE?"

Environment is what is around you, the concepts are still the same.

TS: From my perspective, I don't see an "urban environmental education." For me, EE is a process, and you simply utilize the resources of the learner's environment to teach a universal theme. If you take an urban kid, a rural kid, and a suburban kid, each of them would come to a learning situation with some solid survival skills. If you take those three kids, put them together and do a program here in the city, each [illegible] them will learn something. If you're taking a process approach to this and say, "I want each of them to come out knowing this set of skills," well, these skills can be learned anywhere. Regardless of where you are, you have water, air, sunlight, some plants, and some animals. You build on those pieces, comparing and contrasting these plants and animals with others elsewhere in the world. So what I do with kids studying invertebrates here I do with kids in suburban areas, but I probably would have more invertebrates to play with. If the conditions are right, inverts live right here in the city, so there's a conceptual framework you can create, regardless of where the hell you are.

NSYP: Does a city resident have different educational needs than people elsewhere?

TS: They need a re-tooling of their sensory systems. There was one kid in the Bronx who had just arrived here from Nigeria, where he had lived in the bush all of his 10 or 12 years. He's plopped over on Bathgate Avenue in a fifth-grade class. I took his class to a local park to scavenge during an invertebrates program, and we're out foraging. And here he was finding stuff that nobody else could, looking in areas nobody else would, because gathering grubs and things was part of his diet. He wanted to share his skill with the other kids, but they couldn't process it — "you'd EAT this?!" His rapport with the group improved, and it was interesting for me to have that

(Cont'd Page 7)

TALBERT SPENCE (Cont'd From Page 6)

opportunity to learn about him — he was very environmental.

NSYF: There seems to be a bias against the city in EE circles, that environmental education for a city child best happens when he or she is removed from the city situation.

TS: Yes, and there has to be a balance of both (in-city/out-of-city experiences). The Christadors Foundation funds an urban-based program for junior/senior high school minority kids to get them into the environmental sciences pipeline. They have a camping experience where they leave the city and camp in Massachusetts, then they return to the city for a summer institute with an urban-based set of experiences. It's not disjointed — there's a connection between the two. In fact, the camp is an extension of what they learned in their city experience. What's nice about the program is that those kids who want to continue can branch into other programs led by the NY Adademy and the American Museum of Natural History, continue learning, get a good foundation base, a reasonably decent science base, meet role models of people in environmental careers, and maybe decide, "Yeah, I like this" as a career. So it's additional options that lead them through the environmental sciences pipeline; most minority kids don't hear about this as a career.

NSYF: Let's say you work at a nature center whose audience is primarily urban groups from places like new York or Philadelphia. How do you connect that experience to their home?

TS: Three years ago, Wave Hill established a program for Spanish-dominant children. Parental involvement was built in — we see that as critical in our scheme. In order for a kid to participate in an after-school club, they had to have a parent or older sibling attend as well. So you'd have a father or mother, a grandfather, going on a field trip to the museum or learning how to use the scanning electron microscope. The key was to show working-class folks that the city had lots to do and explore for families. My friend Uta Gore took them to the Hudson River where they seined for the first time. It wasn't so much that the kids knew a whole lot more, but the parent would go away saying, "Shit, look at how special this is for my kid!" They could discuss it with their kid because they were learning at the same time.

I also think it's essential for any field trip program to establish a connection at the school before the trip. It's not fair to the center staff to not have had any previous exposure to the kids. We did that at Wave Hill — every field trip was one piece of a four-part program. To do the field trip, the teachers came to a training session, our staff did a pre-visit, then came the trip, and then a post-trip visit by our staff. You had to take the whole package.

The Academy takes classes on the Long Island Sound. In order for that to work, we take teachers to the Sound, run them through EXACTLY everything we expose the kids to, then go back to the classrooms and say, "All right, how are you going to set up learning stations that will continue this experience?" Trained teachers then become resource people during the trip, and don't allow the center's staff to do it all by themselves, or only deal with discipline. They were part of a team. It's absolutely important for a program to extend itself beyond that single day you've had with them.

Single visits are good for the very young, but for fourth, fifth, sixth graders, you've got to look at multiple-session programs that build on a number of levels. You've got to spend money on staff development so your staff has an understanding of the pedagogy that's going on in schools, and how they can't plan programs in a vacuum. It's essential for nature centers and museums to begin their own advocacy by going in and finding out what the trends are in the schools with respect to science and where resources are being placed, and begin to influence these decisions by getting into the discussion and the decision-making that will essentially affect who visits their facility. Nature centers need partnerships with science educators and curriculum developers so that schools begin to think about EE processes as integral to whole other sets of agendas.

NSYF: One cannot separate EE — or any kind of education — from the context of the school and the culture it's in. Schools in many areas of New York are struggling with a wide variety of social issues. How does EE play into this mix? What priority does it have? How do you do EE in a tough setting where it's tough to do education of any kind?

TS: I think one advantage of the sciences is that it has a "Gee, wow!" quality to it. As long as it's participatory, kids will generally get involved in it. There's just no clear formula. You look at each situation to find one teacher or administrator you can work with. Use one or two classes as a model for the school. We've gone into some pretty tough schools where not all the teachers are interested in participating. That's OK. Their colleagues are involved in something very special and they see the results of that experience being good and they see the enthusiasm emerge from those children. You just gotta turn the kids on! If reading skills are a major focal point, choose content material with an environmental slant.

We ran into some blocks with one program for kids deficient in reading scores. They were put in classes with a saturation of reading, writing, comprehension — and math and science as separate disciplines were lost. A couple of teachers wanted to do our program but said, "These are the constraints." So we just fed them resource materials that had an environmental theme, and the kids are writing, reading about animals or city life or whatever. It's a negotiated thing; you constantly try to feed them alternatives that don't strip away what they feel are the important elements of the learning process.

When you talk about EE, or science ed., teachers immediately get terrified because it's been set up as a separate thing with it's own set of agendas. I talk with teachers about their own skills. I'd say, "What do you do on your day off?" The teacher tells me, 'I grow plants." I look in the classroom. Where are the plants? They say, "Oh . . ." Bring the plants into the classroom. You don't have to call it science!

NSYF: Professional EE'ers also talk about a global quality to education. Yet, as a group, we don't look very global. We're not as racially diverse as we might want to be, and there's a real lack of minority participation in EE professionally. It seems that some of the work you're doing tries to address this, but is more work needed?

TS: Absolutely! We're needing many more people in environmental science fields as we continually screw up our world. We need problem solvers with respect to the environment.

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Rios sees that, and tries to impart that to his students. "I take them across the Ben Franklin Bridge (that spans the Delaware River, connecting Philadelphia and Camden, NJ) and we stand in the middle. I point out the different buildings. I tell them that they're standing in between two cities in two states separated by a river. That's where your water comes from. You're part of all this."

Darmstadter wants her WINS students "to become environmentally literate, concerned, and active. But you can't do that until you develop other skills first, skills like cooperation and problem solving, so we work on both simultaneously." These skills then become useful in hundreds of life situations for the girls.

What, then, should nature centers teach urban children? "There are certain concepts that need to be explored in a natural setting," commented Sandler. "Concepts like change, the use of resources, interrelationships. These can be explored in the natural setting, but these concepts also operate in the urban environment."

When asked about the most important lesson EE can provide urban children, one word came through: stewardship.

"The main lesson that I would draw from a nature center," added Sandler, "is stewardship. People need to transfer that stewardship to their own environment. Each of us is a steward of our environment."

"I try to get them to see the whole picture of the urban environment, and to take care of that environment," said Rios.

Urban environmental education, therefore, provides people with the awareness, information and skills needed to understand and care for the built environment.

In your programming, consider your hidden biases and attitudes toward both the urban and natural environments. If you serve urban residents in your programs, consider what you would like them to take home from their time with you in a natural setting. And if you use the phrase "urban/environmental education" when selling your curricula or center, make sure it really is. Help avoid confusion in EE terminology.

An Urban Primer

A variety of terms are used to describe the city and its environs, some of them in a pejorative sense. Here's some thoughts on these terms:

Built environment: A term advocated by architects and planners to fill a needed void. Better than "man-made" or "artificial," the built environment refers to structures not created by natural forces, but by human hands. You may see "built environment education" used in places, too. Perhaps the term is a bit trendy, but it helps.

Inner city: Dictionaries refer to this as meaning "the central area of a large city, usually including the business and entertainment sections." In practice, however, the term has become a euphemism for non-white sections of cities. Because of the confusion, drop the use of the phrase. Try "central business district" to describe the city's core.

Struggling neighborhood: A friend recently suggested this as a practical alternative to "ghetto," another word that should be used cautiously, if at all.

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Estimates are that 40% of the nation's population will minorities by the year 2000. In New York, 75% of new entry-level jobs will be occupied by minorities. Nature centers have to have a career orientation as an integral part of the program. How NSYF and its members can help is by reaching out to organizations that support minority efforts in education. Let's get some minority interns. Let's get some folks into the pipeline. Nature centers need to reach out to minority advocacy organizations and say, "Hey, here is a very important area." There may be a fair number of young people that would choose this career — it's a sell job because the stimuli around them is saying "be a doctor," "be a lawyer," "be a crack dealer," whatever is making more money. I have learned about a lot of pre-college science and engineering programs for minorities during my year at the Adademy. Most are residential, based at universities. None is in the EE field. It just doesn't exist. So one of my recommendations to NAEE, as an extension of what we're trying to do with minority entry, is to organize a summer institute where ninth and tenth graders would spend two or three weeks — these are kids nominated from around the contry — at this training ground for new environmental educators. Audubon runs their summer camp program for naturalist training; that could be used as a model for encouraging minority kids and young women to pursue entry-level positions in this field.

NSYF: Describe the ideal environmental education program.

TS: It would summarize what we've discussed. I would love to have every elementary student involved, and give one group, like the fifth grade, a camping experience. It would not be an isolated experience, but connected others. A consortium of groups would run the program, with pieces of the pie taken according to the strengths of the staffs. Bridges would connect it to other opportunities, and there would be an endless stream of opportunities for parents, teachers, families. Much of it would be experiential, where skills are applied in real situations so kids can see what it means to make change. I'd strengthen their life-long survival skills as human beings, and then track them to find out what percentage decide to pursue careers in the field. It should be hands-on and content-oriented, but include a collaboration with a lot of different people. I want a multi-cultural experience — kids know so little about other people in the world. I want to build a global connection with an understanding of local issues. It's really having a basic literacy in communicating views about their environment. And at some point, there will be enough minority environmental educators.

NSYF: Do you have a final word for our readers?

TS: The nature center movement needs to re-assess itself a bit. Its constituencies include urban people, and they're really going to have to broaden efforts to open these facilities to these folks, because the face of the nation is changing. If minorities are not involved in nature centers now, they'll see that, and it will be hard for nature centers to stay open. We should be disseminating more information with sensitivities to the urban population, including information on the positives and t' negatives of city life.

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"Urban Environmental Education: A Subversive Form of Community Study?" *Massachusetts Review* 25:1, Spring
1984.

localism are the greater social goods. Only through the media can such ideological sleight of hand occur so quickly and simultaneously; and only when we grasp how the media are the handmaidens of those who control our science and technology, while at the same time effecting unanticipated public responses which do, themselves, shape history, will we really understand the role of science, technology, and the idea of progress in our past, present, and future.

URBAN ENVIRONMENTAL EDUCATION: A SUBVERSIVE FORM OF COMMUNITY STUDY?

Myrna Margulies Breitbart

> "Help us turn a bunch of city kids back into children . . . Growing up is never easy. But it's even harder if you've never been a child. Unfortunately that's what happens to a lot of kids in this city when the streets are the only world they know."
> Advertisement for the Fresh Air Fund, *N.Y. Times,* June 4, 1979.

> "Give them a fresh outlook. Give them some fresh air."
> Advertisement for the Fresh Air Fund, *N.Y. Times,* May 25, 1980.

THE ABOVE ADVERTISEMENTS appeared recently in the *New York Times* for the Fresh Air Fund, an account set up over 100 years ago to fight youth crime by sending the children of the urban poor for two weeks a summer to the "reforming" countryside. The assumptions which underlie this program have always been political in nature and yet are rarely acknowledged. They include the beliefs that cities are somehow non-environments; that city kids [depicted in the ads as black and hispanic] are non-children; that rural settings will keep children out of trouble and favorably mold character; that "good" recreation means learning social graces, respectability and tools for social advancement; and finally, that unorganized play, unmediated by adults, is dangerous.

Many of the conflicts that led to the creation of the Fresh Air Fund and arose with fervor in cities at the turn of the century over who

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was going to colonize and control neighborhood and street life remain alive today. Furthermore, many of the questionable assumptions articulated above continue to insinuate themselves into urban policy devaluing the experience of many urban residents and masking the linkages which exist between historical changes in the mode of urban production and the decay of social and physical space within cities. For children, the "Fresh Air" concept is also reflected in the continuing focus of much environmental education on largely rural themes. These circumstances have led British planner/educator Colin Ward to raise the question of whether we should seek to distance children further from the problems and potentialities of urban life or try to reintegrate them into that life, its problems and all.

There are currently a number of efforts underway in Britain and the U.S. to devise innovative approaches to urban environmental education which would reintegrate children into urban life. I would like to share some of these examples with you and begin to develop a theoretical context for interpreting them as potentially liberating forms of education/community study. Discussion can begin by articulating some of the aims of, and guidelines for, a critical pedagogy. Henry Giroux's recent and extensive writing on the subject (*Theory and Resistance in Education: A Pedagogy for the Opposition,* South Hadley, Mass., 1983) may provide a point of departure.

Giroux begins his analysis by expressing dismay with conservative and radical discussions of education and schooling. The former, he contends, fails to attach any importance at all to uncovering the many relationships which exist between the school and the larger society—its economic and social structures, in particular. Radical educators, on the other hand, argue effectively that the main functions of schools are to reproduce dominant ideologies, and the distribution of skills necessary for the division of labor under capitalism. However, Giroux believes that most radical critiques tend to over-emphasize the idea of domination—the way in which structural determinants promote inequality. Left unexplored is the whole question of how students and teachers alike "accommodate, mediate, and resist the logic of capital and its dominating social practice" through culture.

Giroux's own theories on education do not view working class and minority students as passive in the face of domination. His intention instead is to understand more thoroughly the complex

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ways in which people respond to the interpenetration of their own experiences with structures of domination. He believes that such an understanding will prove that schools are often "contested terrains," and that while they are not necessarily the locus of revolution, they are also not solely determined by the logic of the workplace. Rather, Giroux believes that individuals placed in subordinate positions have distinct "moments of cultural and creative expression" that are informed by a different (anti-hegemonic) logic. Echoing historian E. P. Thompson, he thus urges us to recognize that culture is constituted as much by the subordinate group itself as by the dominant society, and that much conflict results from the manner in which that culture mediates relationships between school, home and the workplace.

The relevance of these ideas to those engaged in community studies comes from this recognition of the importance of dominant and oppositional cultures, and of the need to look *beyond* schools into the streets, neighborhoods, workplaces and homes of students in order to understand the many contradictory elements that play a role in their lives. Giroux thus envisions a role for educators in helping students to secure alternative "social spaces" in the community from which they can then struggle against what he calls a "new authoritarianism," begin to rescue their oppositional culture, begin to incubate alternatives to existing economic and social relationships, and "hope that it will pay off in the future."

The general requirements and objectives which have been identified by many educators as important to a liberating and critical form of pedagogy include the following:

- allowing students to draw on the limited resources at their disposals to reaffirm the positive dimensions of their own cultures and histories
- increasing students' capacities for critical thought and action and their awareness of suppressed needs
- helping students to explore their immediate needs and then to situate them within a broader political and economic context
- aiding them to uncover which values (cooperation, mutual aid, etc.) are indispensable to the reproduction of human life and those which threaten and constrict its very existence
- and enabling students to act collectively to define for them-

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> selves what they want out of life, and then to experience the tension which results from trying to put those visions into practice.

For educators, there is the additional goal of encouraging the establishment of alliances on many levels between educators, students and parents in the local area and beyond. The central focus of work on the role of oppositional behavior and resistance is thus brought forth in a single question which Giroux asks: *"How do we make education meaningful by making it critical, and how do we make it critical so as to make it emancipatory?"*

Addressing this same question 100 years ago, anarchist geographer Peter Kropotkin provided a more explicit justification for considering *environmental or community study* as one powerful means for achieving this end. Stressing the need for an alternative educational method which, when linked to social action, would reduce dependency and make more visible the connections between local problems and the functioning of broader socio-economic and political system, he began to identify some of the potentials for radical learning which environmental education holds. Among them was a recognition of the dialectical relationship that exists between social structure and spatial organization.

Physical environments reflect and come to support the dominant social and economic interests of a society. Thus the study of their current form and transformation over time was felt to be one powerful synthesizing tool for learning about the interaction between social and political forces. Kropotkin believed that imbalances in nature and problems within urban and rural communities were reflections of imbalances and injustices in *human* relationships, and that the latter would be made more explicit through a study of the former. Through geographic exploration, he hoped that children would be inspired to challenge those forces which overtly dominated their lives or inadvertently caused the atrophy of their desire to mold the environment.

Kropotkin was also impressed by the potential which geographic/community study seemed to hold for awakening the imaginations of children and for enabling them to uncover the unique and important contributions of their families to the social history of particular places. He was interested in using environmental education to help reclaim the lost cultures of subordinate populations, and to strengthen the bonds between people by encouraging the exchange of their ideas, common experiences and skills across regional and national boundaries.

Anthony Fyson and Colin Ward, contemporary British teachers and authors of a book entitled *Streetwork: The Exploding School,* have perhaps come furthest in linking politics, culture, the environment, education and protest in advocating the cityscape as an educational resource. Their emphasis on active urban exploration by children is, on the one hand, a reaction against what they see as the passive top-down transfers of most knowledge in inner city schools, and also against the continuing focus of environmental education on rural themes. Both of these tendencies are seen as instrumental to the reinforcement of inequality and the status quo.

Citing many factors which have contributed to the deterioration of the capitalist urban environment over time, Fyson and Ward note how the range and variety of activities open to children have declined. Instead of acknowledging this decline and trying to help children comprehend their place in the city, they see most public effort being directed at diverting attention away from an understanding of urban conflict and questions of race, class and gender. These circumstances have led some environmental educators to suggest the inherently subversive nature of urban community study. Since childhood may be our "greatest period of geographical exploration," it is felt that interaction with real environmental issues and problems through community study may engender in children a critical understanding and creative modes of resistance.

Examples include:

- how children might begin to assess the quality of their living environments and begin to think about altering them
- how controversial issues in a neighborhood can be identified and explained in light of the historical, economic and cultural transformations of the area
- how these "local" issues can be tied to larger political questions
- and how the whole process of exploration and analysis can be accomplished so as to enhance the confidence and critical/creative potentials of children.

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In Britain and the U.S., there are some approaches to urban community exploration which reflect these concerns and are worthy of mention. One involves "sensory walks" and "urban trails" which invite children to experience their cities and assess them critically.

Informal networks of "street teachers," including elderly residents, shopkeepers, et al., can be enlisted to help. While on an urban trail, students are encouraged to take photographs or slides of those items, people and places which interest them; once back in the classroom, they can discuss why they took the pictures and pursue topics which arise.

On a trip that I recently took with sixth graders through a relatively poor urban neighborhood, we came up with photos of everything from garbage heaps and cracks in the sidewalk to wall graffiti and tenants rehabilitating a building. This latter discovery led students to design a project around housing. In the process of doing the study, they uncovered information about a local community development corporation, tenant organizing and housing cooperatives.

On another urban trail experience through a transitional neighborhood in a medium sized city, ten year old students noted the different uses that park space was put to by girls and boys of different age. The girls expressed their fears of teenage male "gangs" and began to explore ways of regaining some control over play areas. When asked what should be done about the "problems" in parks, one indignant little girl replied matter of factly, "*We must call up the community!*" The lively discussion that followed centered on locating this "community" and identifying some of the limited powers that it had at its disposal. The conflicts which arise in any city over planning priorities related to issues of race, class and gender were thus explored at an elementary level, along with some speculation about child initiated projects that might begin to alter the current situation.

In a walk through an Hispanic community students of mixed class and ethnic background expressed conflicting perceptions and cultural interpretations of neighborhood life. Restrictions placed by the school system on the topics which can be broached with students by teachers (race and family background were two) unfortunately made it difficult to explore these differences in any depth. However, the interest that the children expressed in the history of this area did make it possible to alter somewhat the relationship between them and their teacher. The teacher, a white male ex-military officer with strong family ties to the area, bore a noticeable grudge against his Hispanic students. He probably viewed their families as supplanting families such as his own in the area. Yet when children expressed an interest in the fact that electric trolleys

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replaced horse drawn carriages on neighborhood streets, he vividly recounted a story about his father who, as a boy, earned money shovelling horse dung. Faced with the loss of a livelihood, he and his friends found it necessary to sabotage the new trolley lines when they were introduced. The children loved this tale of resistance.

Another school initiated, community based project of interest from Great Britain is entitled "Your City Has Been Kidnapped." This innovative packet is designed to encourage elementary school age children to familiarize themselves with urban social problems and to become involved in the conflicts which arise over their interpretation and resolution. Beginning with a statement which reads as follows:

> Tuesday, 5 p.m.
> Your city has been kidnapped. If you want it returned to you intact, you must follow these instructions carefully.
> 1. It is entirely your own fault that it has been kidnapped. You have been lazy, apathetic and uninvolved and while you weren't looking we just took it away. So the first thing you have to do is to take an active interest in what is happening.
> 2. Secondly, it is you who have to live in the city. You know how it works, what you like best, and what the problems are. You can't expect the Council to know all these things as well as you do. So you will have to make up your own mind about what you want changed, what you want improved, and what you want to stay just as it is.
> 3. Lastly, you will have to fight for what you want. We're not going to give it back to you just like that. You'll have to organize yourself into groups, write letters to the newspapers, lobby your councillors, sit in, and stand up for what you believe in. If you do all this by 6 o'clock tomorrow night, you will find your city waiting for you outside the town hall.
> Signed,
> The Kidnappers

The packet goes on to attribute many existing social problems to the loss of popular control over decisions affecting both work and community life. The "Introduction" also urges citizens to supplant the influence of so called "professionals" and elected representatives with their own experiences and knowledge. Projects are then

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designed to provide children with ideas for exploring various aspects of the urban built environment and neighborhood political, economic and social life.

Examples of the project include:

> "*Who owns your town?*": an exercise to determine who owns local property and what condition it is in; "*What you like and what you don't like*": the categorization of local places to preserve and/or destroy with an action plan for implementation; "*Where is the humor in your town?*": a search for and creation of amusing components of the local environment; "*Counting Things*": a neighborhood inventory of resources (such as abandoned cars, ugly, beautiful or empty buildings; people over 65, etc.) for comparison with other areas, identification of local problems and prospects, etc.; "*Pollute this town*": a diagram of the neighborhood to be filled in with pollutants so they can be identified and removed.

While working on these projects, students are provided with ideas and methods for acquiring more knowledge about their environments. Yet, the end products—the actual information which they do uncover and the interpretations which they give to it—are very much controlled by the students themselves.

One additional project has been introduced into a secondary school curriculum in the U.S. and is entitled the "Environmental Education and Exchange Program." As applied thus far, children in the 4th through 8th grades of selected inner-city schools are asked to pick sites and issues within their neighborhood and to study and write about them in a local environmental guidebook. The book is designed to contain a visual and written description of the site and issues they have chosen. It is also to contain a discussion of the changes which have occurred there over time as a result of political, economic and social forces. Children are then asked to devise a proposal for the future of each site. Every classroom is matched with a classroom at the same grade level in a contrasting environment or cultural setting. Students from these differing environments are then encouraged to correspond with each other. Pieces of the guidebook are shared throughout the year and two or three visits between sites are arranged. During these visits, the host children lead the visiting children on a "tour" of their sites pointing out what is of particular importance to them.

In one project, a Manhattan group identified a local vacant lot as their site and proceeded to reconstruct its past as well as prescribe its future through urban archaeology. Specifically they rebuilt a small replica of the block as it once looked on site with the rubble that remained. Children from rural Vermont, on the other hand, identified several local 19th century mills as being of interest, and reconstructed a local labor history. Significant byproducts of the Harlem/Vermont exchange were the positive steps it made toward breaking down racial prejudice and urban/rural stereotypes.

There is neither the time nor space here to enumerate the problems and prospects that are associated with these examples, and yet, such a discussion is necessary. The particular approach to urban community study described here in brief, is in its infancy. It is, nevertheless, directed at putting local areas to use as vehicles for raising a whole host of socially charged questions related to who controls and shapes particular environments, and how cultural and economic differences mediate people's lives within these environments. The manner in which this exploration takes place, relying as it does on the active involvement of children themselves, is also aimed at empowering them, helping them to break out of cycles of domination. The problems which arise in implementation are very much a consequence of these subversive characteristics.

The opportunity for children to begin to manipulate an environment to meet their needs (or to comprehend why this might not be possible, given cultural and economic constraints) is, thus, a very enticing by product of community study that extends beyond the more limited and typical goals of environmental education for deepening a child's "sense of place." In order for this approach to achieve its potential, however, much additional effort should be directed at learning more about the relationship between politicization and life experiences, changes in the workplace, and changes in the character of communities. How do children acquire a particular political perspective as adults, and how does culture play a role in this process and the prospects for introducing useful change? Furthermore, if community study can contribute to the development of a critical consciousness later in life, at what ages are particular projects most appropriate?

The answers to these questions are not readily apparent. The evidence so far, nevertheless, suggests the importance of directing further attention to environmental and community study as one

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possible form of alternative education. The whole process of exploring an environment which is so central to such a perspective is naturally focused on providing children with "social space." And "social space," it would seem, is at least one prerequisite for the nurturing of critical thought and action.

MYTH AND SYMBOL

Alan Trachtenberg

MYTH & SYMBOL or "image-myth-symbol," are terms which surely will be recognized as designating a certain approach or method employed by a particular group of scholars in the field of American cultural studies, a group which, whatever else it may or may not have in common, shares at least a predominantly literary orientation in their historical work. Whatever the truth in calling this group a "school," or in attributing to it anything like a consistent scholarly method or outlook, the words themselves—myth and symbol—do denote a fairly clear point of view, one which takes a culture to consist in myths, e.g., constructs whose power over collective intelligence and behavior is uniquely powerful, and powerful especially to the extent that it is irrational, based not on empirically-determined "truthfulness" but on other sources of need, of collective purpose, or ideological imperative. Such myths, the assumption goes, operate as mediating symbols whereby persons in the culture take and share a view of reality: which is to say that reality itself is understood to consist not of "facts" or sense data alone, but of those mediating forms which organize, define, and subdue the details of experience, bringing them into conformity with existing patterns.

In this new school, myth is a term interchangeable with "structure of significance" or of "need" (Clifford Geertz; Raymond Williams), or with ideology, a term Geertz defines as a guide or map to a "problematic social reality." Myths operating as symbols, or symbols embedded in images, function, then, as the indispensable forms whereby and in which a society constitutes its agreed-upon collective reality: not only a view of the world, of what it is and looks like, but also a view of individual behavior, of the determinants of behavior, and of relations between the self and collectivity.

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